AMERICAN GAS JOURNAL

NOVEMBER, 1936

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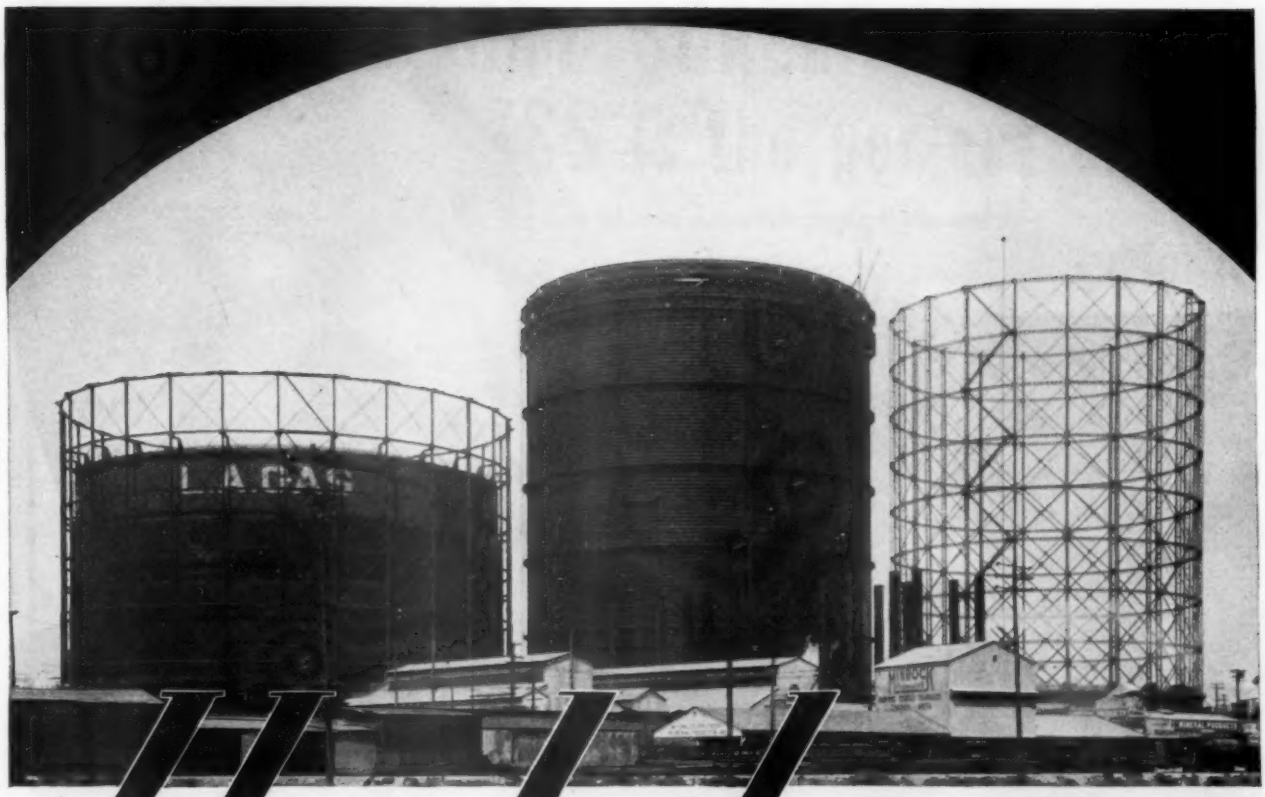
AMERICAN GAS JOURNAL, November, 1936. Vol. 145, No. 5. Published monthly by American Gas Journal, Inc., at 34 North Crystal St., East Stroudsburg, Pa. Executive and Editorial offices at 53 East Park Place, New York, N. Y. Entered as second-class matter, October 7, 1928, at the post office at East Stroudsburg, Pa., under the Act of March 3, 1879.



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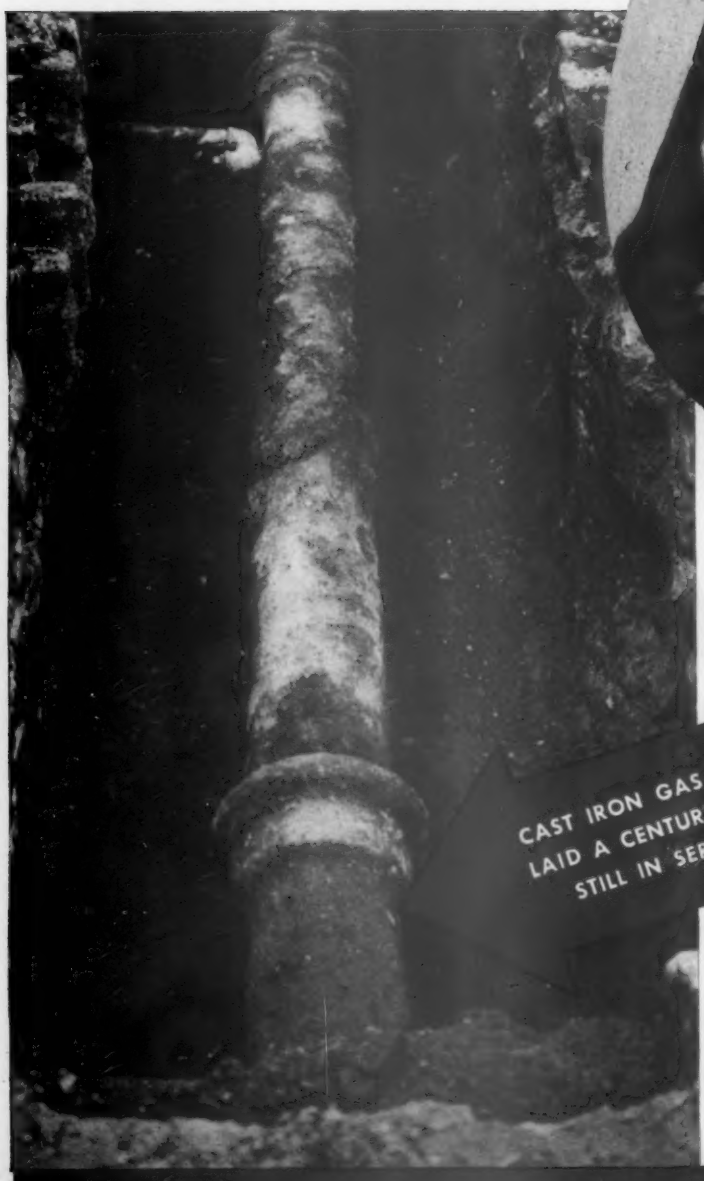

While modern conditions required the development of a bottle-tight mechanical joint, cast iron serves as well today as it did 100 years ago. This cast iron pipe is now in its one-hundredth year of service in Charleston, S. C. You can buy cast iron pipe in diameters from 1¼ to 84 inches.

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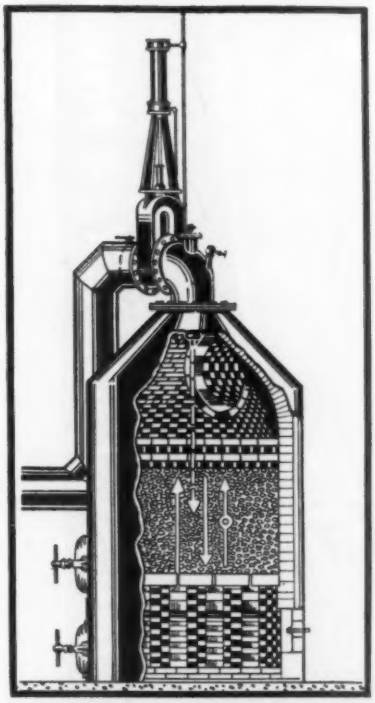
The REFRACTORY SCREEN OIL GAS PROCESS is the perfect answer

for both natural and manufactured gas situations



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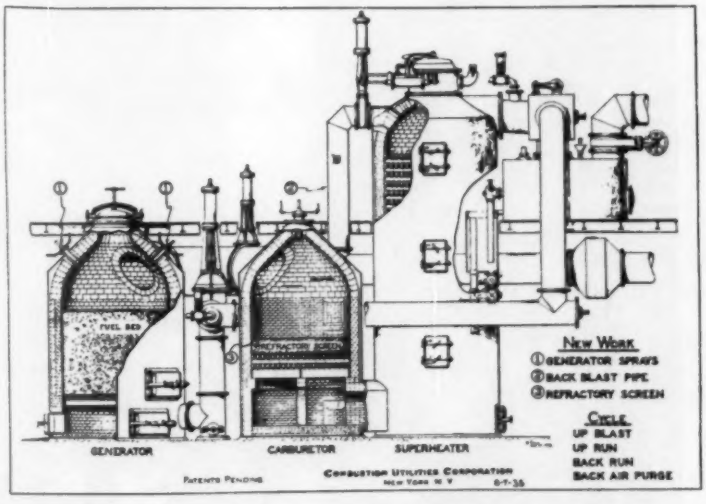
It can be placed in operation quickly in event of pipe line failure or for peak load service, and requires only a small operating crew.

It produces a suitable substitute gas from oil only, at high capacity and high efficiency . . .

Installed capacity of the Refractory Screen Oil Gas Process now in excess of 50,000,000 cu. ft. per day.

Either Process can be readily installed in existing water gas sets



For **MANUFACTURED GAS SITUATIONS:** The Refractory Screen Carburetor Process, an adaptation of the Refractory Screen Oil Gas Process utilizes low cost high carbon oils successfully with low cost, solid generator fuels.

It makes possible a wide variation in the proportion of solid fuels used for generator purposes, thus taking advantage of fuel market price fluctuations for low cost production.

Giving highly satisfactory results in present commercial operation.

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VOLUME 145
NUMBER 5

AMERICAN GAS JOURNAL

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Established 1859

NOVEMBER, 1936

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PUBLISHED MONTHLY BY AMERICAN GAS JOURNAL, Inc., 53 Park Place, New York, S. G. KRAKE, *Publisher;* A. M. GLEASON, *Secretary;* A. I. PHILLIPS, *Editorial Director.* ADVERTISING REPRESENTATIVES: THOMAS MORGAN, *168 N. Michigan Ave., Chicago, Ill.;* HARLEY R. MANKIN, *515 Guarantee Title Bldg., Cleveland, Ohio;* NORMAN C. NOURSE, *861 Market St., San Francisco, Cal.;* ARTHUR K. AKERS, *Tutwiler Hotel, Birmingham, Ala.* Subscription $2.00 per year U. S. A.; $3.00 Canada; $4.00 Foreign. Single copies, 25 cts. Copyright 1936, American Gas Journal, Inc.

five reasons

WHY UTILITIES ARE TURNING TO A CENTRAL FILING SYSTEM

IN no other business can a lost or misfiled paper cause quite so much grief. In matters of dispute or litigation, evidence must often consist of such varied records as correspondence, contracts, leases instructions, plans, agreements, orders, actions, minutes, printed forms, or tracings. Failure to locate any part of such material when wanted may well be the sole reason for losing an important case.

Under present conditions, utilities operating under a departmental filing system, find it increasingly difficult to collect the complete story of any transaction for executive decision. On the other hand, one important utility writes:

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3 Responsibility fixed for producing at once a given piece of material or collection of material regardless of the topic, date or departments handling the matter, as well as no interruptions to the staff outside of the filing department.

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5 Elimination of duplicate reports, forms and correspondence by bringing together all material on one subject. One copy only need be kept permanently thus saving file, drawer and floor space, as well as labor."

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NOVEMBER
1936

AMERICAN GAS JOURNAL

VOLUME 145
No. 5

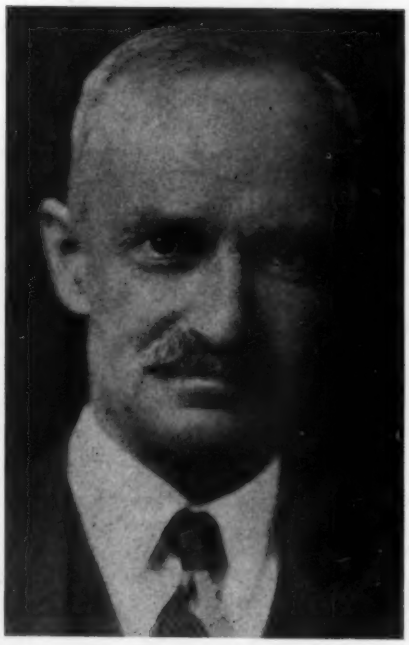
Our Objectives

A Call To Battle

By
Herman Russell
President, American Gas Association

ONE of the speakers at the recent American Gas Association Convention said: "The Gas Industry is awake, but it hasn't yet gotten out of bed."

This well expresses the condition of the Industry at the present moment. Awake to the needs of the hour, cognizant of the things that must be done if our industry is to prosper, for the most part we are still thinking about what to do rather than doing it. We know the public must be made "gas minded;" that old equipment must be replaced with new. Rates need to be made more promotional; our personal and public relations need improvement. Greater sales effort, more aggressive local advertising, a liberal research program, development of new industrial applications, improvement in our technical operations—all require action. Important as all these problems are, the most pressing and the one demanding immediate attention is the retention and development of our domestic market. This is the immediate objective of the Gas Industry. The kitchen is the battleground. The fight is on—the battle upon which depends the future of the Gas Industry will be won or lost in this field. There is no time to lose. We must summon all our forces for a major offensive on this front. It is not sufficient to repel the attack, we must advance. New Homes are being built by the thousands, old homes remodeled, kitchens modernized, new equipment installed. The public needs to be resold on Gas as the best, the modern fuel for their cooking, water heating and refrigeration. The job is one of salesmanship. The tools required are man power, intelligent planning, good advertising, courage to act and hard work.



HERMAN RUSSELL
President, Rochester Gas and Electric Corporation, Rochester, New York.

The job can be done—is being done by some companies, but the Industry as a whole needs to "get out of bed."

Publicity and Advertising Stressed at A. G. A. Convention

Attendance Largest Since 1930

PUBLICIZING the advantages of gas, not only through national advertising, but also by coordinated local effort was the underlying theme of the 18th Annual Convention of the American Gas Association, held at Atlantic City during the week of October 26th.

It seemed that less emphasis was placed on competition this year. The subject has become no less important, but the industry apparently now takes it more as a matter of course and is less afraid of it. Where proper rates have been established and where the modernity and superiority of gas service has received proper publicity, reports indicate that the sale of gas appliances has gone forward satisfactorily in the face of the keenest competition.

The registration of 5,405 was gratifying. Still more gratifying was the business-like atmosphere and the evident intent of those present to get the most out of the meetings and the exhibit. Golf clubs were conspicuous by their absence. The great Ballroom of the Auditorium was filled during most of the General Sessions, and the sectional meeting rooms in some cases were taxed beyond their capacities. Exhibitors reported a serious interest in new designs and new developments by the large number of persons who visited their booths and sensed the confidence of those present in the future expansion and success of the industry.

Address of President Denning

Mr. L. B. Denning, retiring president of the American Gas Association, told of accomplishments during the past year and pointed to our future problems. The following parts of his address are of particular significance:

"It seems to me that the most important thing that occurred this year, if I read the signs correctly and I hope I do, is the resurgence of new birth in the Gas Industry. It seemed to me for some years that one section of our industry was suffering from over-complacency, over satisfaction in what they were doing, and another section was suffering somewhat from a defeatist complex—a sort of feeling of "what's the use?"

N. C. McGOWEN
Vice President

Both have been shaken out of that attitude during the past year.

"Those of you who were at Chicago last year will remember there came out of the West a man with a voice and an idea. His courage was unconquerable, his logic irrefutable, and his eloquence irresistible. Those of you who were there know that James A. Pollard came from Seattle and brought forth an idea which was met with possibly some skepticism. But he wore that down by the force of his arguments and there was born the idea of a National Advertising Campaign for the Gas Industry. So successful were those arguments that they resulted in the setting up of a Committee on National Advertising very ably headed by your incoming president, Mr. Russell, who with his usual force, acumen, business ability and strength, and in spite of all opposition, drove through a financial program, assisted by the other able members of his committee, which resulted in the accumulation of a fund which justified the experiment in National Advertising. I am happy to tell you all, but which some of you already know, that the fund raised was ample to justify the experimental program.

"A Copy Committee, under the jurisdiction and direction of Major T. J. Strickler of Kansas City, was organized, the personnel of which consisted largely of the advertising managers of the major companies, based upon sectional representation. I think all of you have seen the copy which is appearing in national magazines, and I think you are all proud and happy that the start was made. My congratulations to that committee for the splendid work they have done.

"I think that committee has caused this slumbering giant of ours to shake off the shackles of complacency, and to take on new life, and to awaken the power that is within the industry, itself, and to go determinedly forward to new fields of endeavor.

"I wonder how many of you have ever given any thought to what is

American Gas Association Officers, 1936-37

President: Herman Russell, president, Rochester (N. Y.) Gas & Electric Company

Vice-Presidents: N. C. McGowen, president, United Gas Public Service Company, Shreveport, La.; Conrad N. Lauer, president, Philadelphia (Pa.) Gas Works Company

Treasurer: J. F. Rooney, assistant to executive vice-president, Consolidated Edison Company of New York, Inc., New York, N. Y.

CONRAD N. LAUER
Vice President

really the potential strength and power of this industry if it was once thoroughly organized and that power put to use.

"I quote to you some figures given by a representative of the Federal Trade Commission, who appeared before a Congressional Committee considering national regulation of natural gas pipe lines. To me these figures were astounding. We are accustomed to hearing much these days about the electric industry. We may yield to it in some respects, and recognize its importance in the social fabric of our lives, but how many know that measured in terms of efficiency, in delivered energy during the year of 1934, natural gas alone delivered to America two and one-fifth times the total amount of electric energy produced by all the electric plants in the United States. Not included in those figures is the potential energy of the Manufactured Gas Industry. When we consider that gas in one way or another affects the daily lives, comfort, welfare and even the health of nearly 50 million customers, or approximately 50 per cent of the total continental population of the United States, I think possibly we have some idea of the vast part we play in the life of our country and its people. I would suggest that the visual forces behind that be organized in such a way, and also humanized in such a way, that you can carry home to the consuming public the value of this service to them.

"The Mystery Chef Program, which many of you are familiar with, and which has been broadcast throughout the New England States and along the Atlantic Seaboard, and in some sections of the West, and which was experimentally introduced, has given excellent results and I look forward to seeing the Mystery Chef program broadcast more extensively during the coming year.

"During the past year there has not been very much legislation enacted by state legislatures which affected the gas industry—either division of the business. Perhaps the most notable exception was in Texas in reference to natural gas reserves. I may say, however, that this legislation in Texas would not have been enacted had not the Natural Gas Industry of the Southwest presented a united front and was determined to procure legislation or legislative action so as not to destroy or completely annihilate the natural gas reserves for the use of the consuming public. If I may be pardoned for a personal reference, our own company was one of the pioneers and leaders, but we were not alone because we received very able cooperation and assistance from nearly every company in the Southwest.

"In National legislation, two enactments have been put on the statute books, one of which will prove very important and one which may not as yet develop so strongly. The important one I refer to is the National Security Act to which very great attention is being directed at the present moment, and which becomes effective the first day of January, 1937. It is not necessary for me to go into the details beyond saying that it provides, or attempts to provide, a system whereby employment insurance may be set up through the collection of a portion of the earnings of the employees and contributions from the earnings of the companies. Just how well this legislation may work or how effective it may prove, only time and experience can tell. Doubtless it will require some amendments and only experience and time will determine what those amendments shall be. We approach the matter with temperance and patience and will await the outcome to see what the developments may be. The act has not yet passed the test of legal action, and that, I believe, is in the course of process, and it is possible that the act may be declared unconstitutional. But he is a brave man who declares what will or will not be declared unconstitutional by the courts.

"The Robinson-Patman Act is the other to which I referred. It is impossible at the present time to say how that materially affects the Gas Industry. However, with the ever-prevailing tendency on the part of governmental authorities to extend their authority, and extend it beyond possibly the spirit and tenor of existing legislation, it is possible that some attempt may be made to extend the effects of that act to our industry.

"I may say that I have been informed that there is already in preparation a supplementary act by the same authors which will attempt to enlarge and extend the authority of that particular act, which will be presented to the next National Congress. Whether or not it will be adopted it is impossible to predict at this time.

"As an evidence of the encroachment of National regulation upon states, one matter has been brought to our attention quite recently. Heretofore it has been considered that the matter of classification of accounts and methods by which the industry should keep its books, were purely local. Recently there has apparently been a determination on the part of National authorities to attempt to direct the state authorities as to how they should set up their accounts and how they should direct the industry, or that portion of the industry under local and state control, to keep their accounts. The situation at the present moment is in the hands of the very able Chairman of the Ac-

J. F. ROONEY
Treasurer

counting Section, Mr. Griffith and the members of the Committee on Uniform Classification of Accounts, and it is being handled with care and discretion and you will be advised from time to time as the situation develops.

"During the past year we have had to meet problems brought about by the elements, by frost, and by flood in many sections of the country. However, these conditions have been met with courage and fortitude and skill. I think the spirit in which the rank and file have met these conditions is well exemplified in a case that came to my attention when one of our men, mud from head to foot and weary from loss of sleep, staggered in and said: 'Well, boss, we had a Hell of a time and nobody knew it but us.'

"Under this subject of taxation, we have many new things confronting us. I don't think there is any enlightened business man but what realizes that social security, whether it be under that name or some other term, is with us and will stay with us. But the proposition simply means that we who work and earn must pay the bills for those who do not work and earn. It is not a new problem of society—it is age old. Always those who have worked and earned have had to take care of those who could not work and earn or would not work and earn—even so far back as the days of early tribal customs.

"We are confronted with an almost impossible task, from my point of view. I have never yet seen anybody win a race who was tied hand and foot. How are we to meet these burdens with our feet tied by the tax gatherers and our hands tied by the regulatory authorities, is beyond my conception. Something must give away. I don't believe it will be our industry. We can meet these burdens, we can assume them and carry them but we must be allowed to earn and have the ability to earn enough to carry them, otherwise it is an impossible task.

"I want to direct your attention again to the Appliance Exhibit. This is the first one we have had in two years, and it seems to me it marks a new era—and I can think of nothing better on the spur of the moment which better describes what I intend to say—it marks a new era in that there is a new feeling and a new resolve in the determination to go ahead in the development of appliances to meet existing demands, and not only for the profit of the manufacturers but for the profit of the consumers as well. The manufacturers are producing appliances today which our people can go out and sell and overcome sales resistance easier than with the old fashioned appliances. I congratulate the manufacturers on their work in that respect and am quite confident that it will be continued."

Report of Managing Director A.G.A. Alexander Forward

Major Alexander Forward, Managing Director of the Association, reported on the progress of the industry as follows:

"Domestic customers served by manufactured and natural gas utilities totaled 15,236,600 on August 31, an increase of nearly 100,000 during the first eight months of 1936. This gain in customers is reflected in the fact that a total of some 910,000 gas ranges were sold in the country during the first eight months of this year. This was an increase of 28 per cent over the first eight months of 1935. Approximately 80 per cent of such sales consisted of relatively high priced ranges incorporating modern automatic features, such as oven-heat control, etc.

"The past year and a half has been characterized by an increasing appreciation of the great potential market for domestic water heating. There has been a widespread adoption of rates more favorable to the use of gas for this purpose. This has been accompanied by a marked acceleration of local sales effort and a nation-wide coordinated campaign to promote the use of gas for water heating. So successful have been the results of this program that it will be continued during 1937. For instance, the sale of automatic type gas water heaters during the first eight months of 1936 was running more than 50 per cent above that of a similar period during 1935.

"Many gas companies have also recently inaugurated more favorable rates for gas house heating through central plant burners and equipment. The sale of such equipment registered an increase of more than 100 per cent during the first eight months of 1936.

"Revenues of manufactured and natural gas utilities aggregated $520,507,800 for the first eight months of 1936. This was an increase of 6.8 per cent over the corresponding period of 1935. Revenues from industrial and commercial users increased 16.1 per cent, while revenues from domestic customers gained 3.0 per cent.

"Manufactured gas industry revenues totaled $252,644,000 for the first eight months, a gain of 1.8 per cent. Revenues from industrial and commercial uses of manufactured gas gained 11.6 per cent. Revenues from domestic uses, such as cooking, water heating, refrigeration, etc., were 1.5 per cent less than for the corresponding period of 1935.

"Revenues of the natural gas industry for the first eight months amounted to $267,863,800, a gain of 12.0 per cent over a year ago. Revenues from industrial uses increased 21.0 per cent, while revenues from domestic uses gained 7.7 per cent."

Address by Mr. Milne-Watson

Mr. Michael Milne-Watson, son of Sir David Milne-Watson who is known to members of the gas industry throughout the world as Governor of The Gas Light and Coke Company of London, extended greetings from Great Britain and gave a brief but enlightening talk on his impressions of the gas business in America. On the one hand he was surprised by the amount of public interference with the management of our companies, and on the other hand he was equally surprised at the amount of free customer service rendered and the lack of appreciation of this service by our customers. President Denning subsequently pointed out that it is our task to make our customers conscious of this service, which is "completely unknown in other countries."

National Advertising Campaign

The importance of an adequate local tie-in to the National Advertising Program was stressed by Major T. J. Strickler.

"One year after the first action was taken by this Association, we stand before you. Your committee to conduct national advertising has done everything that we feel could be done. We have developed the campaign to the point where it is again up to you gentlemen, individually and collectively, to decide whether or not you are going to carry the program to complete success.

"We did not originally, and do not now, expect any of the 700 companies supporting this program to come along with us for the good of the order, or for the glory of the gas business, or for any other big-hearted reason. We want every company to get something tangible out of this push for increased busi-

(Continued on page 14)

Munroe, Beal and A. G. A. Medal Awards

© *Blank & Stoller*

LEON J. WILLIEN

LEON JOHN WILLIEN, operating engineer, Byllesby Engineering and Management Corporation, Chicago, Ill., received the Charles A. Munroe Award, Oct. 29th at the Annual Convention of the American Gas Association in recognition of his outstanding contribution in the general interest of the gas industry.

One of the highest honors bestowed by the Association, the award was made to Mr. Willien for his "rational and consistent research, success and number of applications, generosity of contributions, originality and usefulness to the industry, in the field of advanced processes for manufacturing, mixing and transmitting gas."

Presentation of the award, which consists of a substantial financial acknowledgment and engraved certificate, was made by Marcy L. Sperry, president of the Washington Gas Light Company, Washington, D. C., and chairman of the Charles A. Munroe Award Committee. In addition to Mr. Sperry, the committee was composed of: Charles W. Bradley, Vice-President, Public Service Company of Northern Ill., Chicago, Ill., and Harry D. Hancock, Engineer, Cities Service Company, New York, N. Y. The committee's recommendation was approved by the Executive Board.

One of the outstanding honors within the gift of the American Gas Association was conferred upon George Edward Hitz, superintendent of distribution, gas department, Central Hudson Gas and Electric Corporation, Poughkeepsie, N. Y., Oct. 29th at the Association's Annual Convention. Mr. Hitz received the Beal Medal for contributing the best technical paper to Association meetings throughout the year. The presentation was made by F. A. Lydecker, chairman of the Association's Technical Section, acting in behalf of the family of the late W. R. Beal who established the award in 1897.

G. EDWARD HITZ

The paper which won this conspicuous recognition for Mr. Hitz was entitled "Experience in Leak Proofing Bell and Spigot Joints." Leakage in bell and spigot joints has been a subject of great interest to gas distribution engineers for many years. Mr. Hitz's paper, in the unanimous opinion of the award committee, represents a distinct forward step in improving the efficiency of gas distributing systems.

The award consists of a bronze medal and a substantial cash payment. It has been bestowed sparingly, the list of those so honored containing the names of many well known leaders of the gas industry.

**This paper was reprinted in full in April 1936 issue American Gas Journal*

Heroic action by George L. Creely, gas distribution superintendent, Public Service Electric and Gas Company, Somerville, N. J., in averting a serious fire, was recognized at the annual convention of the American Gas Association. Mr. Creely was awarded the American Gas Association Meritorious Service Medal for having performed the most meritorious deed in the saving of life in the gas industry. The presentation was made by the Association's president, L. B. Denning, president of the Lone Star Gas Company, Dallas, Texas, Oct. 29th at the Annual Convention in Atlantic City.

The act for which Mr. Creely was so singularly honored occurred during a severe electric storm at 2:00 P.M. on May 13, 1936. A bolt of lightning had struck a 216,000-gallon gasoline storage tank on the property of the Standard Oil Company located on Second Street, Somerville, just adjacent to the property of the gas distribution department of Public Service Electric and Gas Company at the corner of Hamilton and Second Streets. The lightning bolt had opened a seam in the overlapped metal folds along the edge of the tank top for a distance of approximately six feet, allowing gasoline fumes to escape from the tank, which at the time contained 110,000 gallons of gasoline. Escaping fumes from this opening ignited and

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GEORGE L. CREELY

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ness. We want every company to cooperate with every possible outlet for gas appliances and interest them in this campaign. To do this is the responsibility of the local management.

"National advertising of the character we are doing has never yet failed to produce results when an industry sponsoring it had a superior product to sell, and when the units or members of that industry were sufficiently enlightened to identify themselves with every step of the national program.

"What do I mean by 'identify'? Just this: Are your customers aware that this advertising is your advertising? That you are an actual supporter of and participant in this drive? That the gas appliances shown in the ads are sold by your company?

"How about your employees? Are they aware of your program and its opportunities? Are they prepared to talk about it to customers—prepared to say with pride that the ads currently appearing in national magazines are ads sponsored by their own company?

"Your customers think nationally but act locally. The gas industry to them, is your company. The thing that is being exploited nationally in this big drive is the gas business—your business, and my business. By using the material specially prepared for you—photographs, electrotypes, posters, car cards, and other ready-to-use tie-in devices—you can give the national program the local identity it must have to be successful."

Mr. Henry Obermeyer stressed these same points in the Commercial Section Meeting. "The real danger," he said, "lies, not with our critics, but with those whose excess of enthusiasm leads them to feel that the whole job is as good as done once the advertising appears.

"I can simply say that one of the essentials—the one essential, in fact—of getting your money back, let alone making a profit for your own company out of national advertising, is to tie-in with it at every possible point. That doesn't mean taking the recommendations of the national advertising committee, lock, stock and barrel and superimposing them on your present, probably very excellent, advertising operations. You own judgment will determine which of the various proposals in the Committee's plan book will best fit your local situation, and undoubtedly your imagination and the ingenuity of your advertising manager will discover opportunities that would not have occurred to a mere outsider. The important thing is not which particular tie-in you adopt, but that you do something tangible and striking to identify your company in the eyes of your customers with the national trend to gas which A.G.A. cooperative advertising is helping to get under way.

"Any gas company that fails to tie-in with the industry's national advertising program is like a traveler who has bought a ticket but has missed the boat."

Research

Mr. Clifford E. Paige, President of The Brooklyn Union Gas Company stressed the need for more research in the gas industry. He pointed out that the American Gas Association had wisely appropriated 27.1% of its revenues for that purpose but aside from that the manufactured and natural gas companies were using only one hundredth of one per cent of their revenues for research. "I told your Finance and Control Committee," he said, "that I favored an increase in the Association dues, because I believe we have got to organize this thing better and we have to spend the money to get results."

Among the prospective possibilities for research in the manufactured and natural gas industries, Mr. Paige mentioned the following:

1. Publicity and advertising.
2. Public relations.
3. Market analyses and statistical studies.
4. Utilization equipment covering all types of equipment.
5. Rate studies.
6. Personnel relations, including labor and management.
7. Production including at present unknown possibilities of natural gas as well as problems of conservation.
8. Transmission and distribution.
9. Accounting systems and equipment.
10. New uses and new types of apparatus.

There are two kinds of research, applied and fundamental.

"Applied research is 'development' and as such is usually best handled as a local undertaking. Its accomplishments may be clarified and expedited by free interchange of knowledge at convention discussions. 'Development' is the child of a single-minded energy, vision and resourcefulness. It comes to meet a definite situation with a definite remedy.

"Pure or fundamental, research anticipates a need and brings opportunity where none was known to exist. Clearly, this kind of exploratory effort is the concern of all, especially where an industry may, by its nature, work cooperatively rather than competitively.

"In either kind we need not apologize for what we have not done. Quite the contrary, if the achievements could be set down and added up I believe our aggregate would, in consideration of our resources, compare favorably with any. Who else has such a record as that of our own American Gas Association Laboratory?

"Our interest is to develop our business; to make it impregnable to competitive raids; to pay interest on our debts and to maintain our bonds as legal investments; to provide our stockholders with dividends and assurance of their continuance; to give our employees a place where they are proud to work; and to earn and enjoy public confidence in our communities. Does it matter whether or not we call this Research?

"We know that to accomplish all or any of these things will require—education, study, publicity, and faith. I have never before heard faith included in a program of Research but who can deny it a rightful place?

"We conclude, therefore, that we are discussing the development of the gas business on an industry-wide basis, that competition and the stimulus to furnish service at a profit are the impetus, and that Research effort in this business must be largely local as applied to existing equipment and principles, and national when concerned with the exploration of new possibilities.

"It is hard to get money for a specific project; it will be harder to get it for pure research. The donor wants to know, and rightly, in what direction the effort will be made. The job calls for two committees. One which I might designate as a Junior Committee would receive all suggestions, make plans for procedure, determine relative importance of project and submit a report and recommendation to the group which I might designate as a Senior Committee. This group should be composed of men who if they agreed an enterprise were worth while, could collectively assure its support."

Natural Gas Reserves

Dr. John W. Finch, Director of the United States Bureau of Mines, discussed the probable reserves remaining in certain of the now important natural gas fields, as well as the various estimates that have been made for the country as a

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Our Convention and Exhibit

By W. T. RASCH

President, Association of Gas Appliance & Equipment Manufacturers

IN my more than twenty-five years attending conventions and exhibitions of the gas industry, I have never attended one which impressed me so much as the convention and exhibition just held in Atlantic City.

The American Gas Association is to be congratulated on the exceptionally fine papers that were presented at the various meetings. They were highly instructive and, as never before, very much to the point.

The Association of Gas Appliance and Equipment Manufacturers, which was responsible for the exhibition of gas appliances and equipment held at the Auditorium in Atlantic City, is to be congratulated on the handling of the exhibition. Never before in the history of the gas industry do I recall an exhibition of gas appliances and equipment which was so carefully worked out and so well conducted in every respect.

The individual members exhibiting are to be congratulated on their excellent booths. When one entered this huge hall, the impression of neatness, beauty and order was immediately apparent. There was nothing gaudy, but rather a simple harmony throughout the entire exhibit.

W. T. RASCH

Never before were there on display so many new and improved appliances. Never before did so many utility men actually attend the various booths to seek information. Never before was so much interest shown in equipment. It would have been indeed hard to point one's finger at any particular manufacturer's display and say that it was much better than the majority of displays.

The feature of giving automobiles away each afternoon was one which I feel was well worth the money spent by our association because of the interest it created and the great numbers of people who were drawn into the exhibition to witness the awards.

The feature of making all utility men attending the convention pass through the Exhibition Hall also was a notable innovation. The manufacturers of gas appliances and equipment spent substantial sums of money in order to put up attractive booths with the sole idea of having his customers inspect them. Therefore, all of these features which brought customers into the hall were worth while.

The gas industry as a whole should be extremely proud of the Association of Gas Appliance and Equipment Manufacturers and its members. Everyone who attended this wonderful exhibition must have been impressed with the fact that the manufacturers have awakened and displayed appliances and equipment properly styled, ingeniously constructed and of high efficiency.

First Annual Meeting of the Association of Gas Appliance and Equipment Manufacturers

THE First Annual Meeting of A.G.A.E.M. was held at the Hotel Traymore, Atlantic City, at 4:00 P.M. on October 25.

The accomplishments of the Association during the brief space of one year as reported by the officers were indeed impressive. It has become a well organized, going concern; it has sponsored one of the best exhibits of equipment and appliances that the gas industry has ever seen, and it has ended the year with a modest but none the less definite surplus.

Report of President

In his report as President, Mr. W. T. Rasch said in part: "We close our first fiscal year with every evidence that the Association truly represents an overwhelming percentage of the production and distribution of all classes of gas appliances, gas apparatus, and gas equipment. We were organized in October of last year for the express purpose of promoting the use of gas as a fuel. It is the confident belief of myself, as your president, and it is the thought of your Board of Directors, that this purpose has always been first in our minds and has been the basis for all of our decisions during the year.

"The Association was organized under the laws of Illinois as a corporation not for profit. Its Board of Directors includes representatives elected by the group of manufacturers interested in particular classes of products, and also includes a president and a vice-president who consider themselves elected to represent the industry as a whole. By this method we have secured representation of the particular points of view of the manufacturers of each kind of gas appliance and equipment and at the same time we have united these points of view into an industry solidly behind the promotion of gas as a fuel.

"The gas range manufacturers meet as gas range manufacturers and consider the problems of the gas range manufacturers. Similarly, the gas water heater manufacturers meet as gas water heater manufacturers and consider the problems of the gas water heater manufacturers. The same thing is true as to the manufacturers of house heating and air

MERRILL N. DAVIS
Vice President

conditioning appliances and equipment. We have a strong division representative of gas meters and we have a similar separate organization for thermostatic accessories. Effective work has been done by the gas cock group and there are encouraging signs of awakened interest on the part of the gas space heater group and on the part of the groups representative of industrial gas equipment, of hotel equipment, and of flexible tubing. The work that has been done during the first year in each of these groups indicates to me the necessity for maintaining them as separate divisions of our Association and for encouraging frequent meetings of each group for the full consideration of their particular problems.

"The Association was organized as an independent trade association with its own officers and office and with its own publications. It is highly desirable, in my opinion, that the Association should continue as an independent trade association. The problems of our manufacturers should be dealt with by a trade association of manufacturers.

"During the year much attention has been given by our members and by special meetings of product groups to the important problem of research. A joint committee was appointed, representing members from the American Gas Association, and members from the Association of Gas Appliances and Equipment Manufacturers to carefully consider the problem particularly as to the domestic research being carried on by the A.G.A. Laboratory. Our Association did not feel that the method adopted by the laboratory of conducting this research work was to the best interest of the industry as a whole, and certainly might be detrimental to the manufacturers. We feel that considerable progress has been made by our committee and that a better understanding has been reached.

"I wish, however, to emphasize that our association believes in the principle that utilization research work must be continually carried on. Without it no industry can prosper. We also believe that development research should be left to the manufacturers who by virtue of the economic demand for constant improvement in order to meet competition, have successfully met their obligations to the customer by producing and marketing gas appliances having a general public acceptance. The manufacturer also is constantly alert to meeting the demands for and promoting new uses for gas as a fuel.

"Our Treasurer has reported to you a satisfactory statement of revenues and disbursements. The dues have been promptly and cheerfully paid into our treasury. Our disbursements have been made strictly under the terms of the budget adopted by our Board of Directors. Our finances are in excellent condition as evidenced by the fact that we closed the year with a modest surplus. As your President, I would recommend that you continue to build up a satisfactory surplus.

"During the year we have had a start in the publication of a monthly bulletin. I want to personally thank those who have contributed articles and news items to this bulletin. It is a medium for the exchange of our views. We do not want a fancy or elaborate publication. We need the sort of publication we have and we ask the members to strengthen the publication by submitting articles and news items and suggestions to our Secretary.

"It is difficult to end the report of the first year without making some reference to the problems that we have before us. I shall try to do this very briefly. In the first place, we need and must have full membership representative of the entire industry in each and every section of the country.

"In the second place, we need a coordinated program for national sales plans and promotion. The excellent work that is done in an outstanding manner in the sales contests on gas refrigerators, and gas water heaters must be coordinated with equally effective work on gas ranges, gas space heaters, and other gas appliances. Our Policy Committee has this matter under advisement and we expect that the incoming administration will make definite progress in

DONALD McDONALD
Treasurer

this regard, covering all gas appliances in all sections of the country. This problem bristles with difficulties but much can be done if all the manufacturers take the same constructive point of view that has been taken during the past year for example by the gas water heater manufacturers and others.

"Fundamental to planning for extending our markets is the need for a full analysis of what these markets promise. We must have accurate data on the status of our present sales and the potentials of our future sales, both in replacement and new fields.

"In the third place, definite work can be done and should be done on the coordination and strengthening of research projects. A clear line of demarcation should be made between safety testing, which belongs outside of our industry and is a check upon our industry, and the equally important field of product development which is a matter of commercial competition to be vigorously handled within our industry.

"In the fourth place, we must continue as a trade association to give unremitting attention to matters of legislation or else we shall find ourselves regulated in ways that are harmful to us as an industry and injurious to our customers. It is not possible to blueprint all the activities that this vigilance requires. It is sufficient to say that it is most important and the trade association is the proper vehicle for carrying out such reviews and such recommendations as will truly reflect the best opinion of this industry.

"The past year has proved to me conclusively the necessity for a strong trade association of gas appliances and gas equipment manufacturers. As a matter of fact, in looking back it is very difficult to realize how the industry continued without an organization which truly represented one of the most important parts of the entire gas industry. The gas industry is made up of two important parts, the utilities, and the manufacturers. The utilities have had and have today a strong organization representing them through the American Gas Association. Now it can be said that the manufacturers have a strong organization representing them through the A.G.A.E.M. It is impossible for any industry to prosper unless its component parts cooperate and finally that industry only becomes as strong as its weakest part. Therefore, it must be evident to not only the manufacturers but particularly to the utilities that the stronger the A.G.A.E.M. becomes the stronger the industry itself will become."

Report of Secretary

The report of the Secretary, Mr. C. W. Berghorn, gave further indication of the organization, activity and usefulness of this young but virile association. A few of the more important paragraphs only are quoted.

"At our organization meeting in Chicago last year there were 80 manufacturers enrolled in our membership. At the close of our fiscal year September 30, 1936, we are proud to report a membership of two hundred and forty-five. The additional members we have secured since that date would indicate a membership by the time our next fiscal year closes of well over three hundred.

C. W. BERGHORN
Secretary

"We now have organized a complete statistical department; complete in equipment and personnel and its services are available to all our divisions. We now compile monthly production statistics for—gas ranges; gas-fired boilers; gas-fired furnaces; conversion burners and gas steam radiators, and expect through a plan approved by the Gas Water Heater Division to have available for them statistics on that industry.

"It is possibly of more than passing interest for us to learn from these data of the very encouraging indications in the gas appliance industry. Shipments of gas ranges for the first eight months show an increase of 28% over the corresponding period of last year, and on the figures available we estimate that during 1936, 1,400,000 gas ranges will have been sold. On domestic house heating appliances tremendous gains have been enjoyed during the eight months period for which we have figures available; gas fired boilers have increased 86%; gas furnaces over 148%; gas conversion burners 102% and the gas-fired steam radiators industry in the sale of their appliances show an increase of 85%.

"These figures reveal that the gas appliance industry is receiving its share of new business through expansion and new construction. Our competitors in the appliance field report gains of 44% in oil burner shipments, while mechanical stokers advanced 67% during the 8 months period."

Laboratory Activities Committee Report

Mr. Frank H. Adams, Chairman of the Committee on Laboratory Activities presented an important report which contained the following views with respect to research and appliance testing:

"On April 14, 1936, a committee was appointed to meet with a committee of the American Gas Association to discuss laboratory activities, particularly in respect to research progress being carried out by the A.G.A. Laboratory and any other matters on which the cooperative action between the American Gas Association and the Association of Gas Appliance and Equipment Manufacturers would be mutually helpful.

"Your committee has presented the viewpoints of the manufacturers as follows:

1. The Laboratory was established to approve the equipment of manufacturers and should not undertake any other activity which would tend to undermine the confidence of the manufacturers in this primary function of the laboratory.

2. Research by the laboratory on equipment was, in general, not considered the proper function of the laboratory. We did not question the advantage of more research or the right of anyone, including the American Gas Association, to do such research as they thought necessary or advisable.

3. In view of the close association of the members of the A.G.A. and A.G.A.E.M. and the fact that A.G.A.E.M. now represent a large majority of all manufacturers in all lines of equipment, there should be a closer cooperation between them. On research the manufacturers could cooperate to set up fundamental research of benefit to the manufacturers as a whole without duplication and without such research becoming a competitive action. On approval the manufacturers should be represented on the various requirement committees and management committee by representatives designated by A.G.A.E.M. who could speak for the manufacturers as a whole.

"At the last joint meeting of the Committee on September 30th, the following two resolutions were unanimously adopted:

WHEREAS, the Joint Committee on Laboratories Policies has carefully reviewed the needs of the industry in advancing the level of performance of domestic gas appliances and

WHEREAS, the said Committee has fully investigated the contributions that fundamental and applied research can be expected to make toward this objective, and

WHEREAS, the Committee on Domestic Gas Research has been charged with the duty of conducting research in this field,

NOW, THEREFORE, BE IT RESOLVED, that it is the belief of the Joint Committee that the common objective can best and most quickly be attained by the projects of the Committee on Domestic Gas Research being of a fundamental nature; and

BE IT FURTHER RESOLVED, that the manufacturers agree to cooperate toward attaining this objective by supplementing the said fundamental research with applied research and development. And,

BE IT FURTHER RESOLVED, that the A.G.A.E.M. be invited to select three members of the Committee on Domestic Gas Research, each to serve for a term of three years, the terms to expire on succeeding years, and, undertaken, the A.G.A.E.M. be invited to appoint a technical advisory committee from that particular Product Group to confer with the Committee on Domestic Gas Research on technical matters.

WHEREAS, the Joint Committee on Laboratories Policies has determined that a closer cooperation between the A.G.A. Testing Laboratories and the gas appliances and equipment manufacturers is desired; and

WHEREAS, the present method of appointing the manufacturer representatives on the various committees associated with the operation and management of the A.G.A. Testing Laboratories places these representatives in an indefinite status as representing the manufacturers as a whole; and

WHEREAS, the Association of the Gas Appliance and Equipment Manufacturers now has in its membership the majority of manufacturers of the various types of appliances and equipment tested by the A.G.A. Laboratories and these manufacturers are organized in separate division according to types of appliances and equipment, so that they are in a position to consider and act as a group on matters relating to each type of equipment;

NOW, THEREFORE, BE IT RESOLVED, that the Executive Board of the American Gas Association be requested to authorize and direct the putting into effect of a policy of appointing manufacturers' representatives to the various A.G.A. Laboratories' committees from representatives selected or endorsed by the Association of Gas Appliances and Equipment Manufacturers.

"Your Committee feels that this action is very constructive and will make possible a much more cooperative action between the two Associations on these matters and eliminate the misunderstandings which have grown up in the past.

"In accordance with the resolution, relating to the Research Committee, the A.G.A.E.M. should select three members of the committee on Domestic Gas Research of the A.G.A. to serve for a term of three years, the terms to expire in succeeding years.

"As each research project is undertaken, the A.G.A.E.M. will be invited to appoint a technical advisory committee for the particular product group to advise with such committees as are appointed from the A.G.A. on technical matters.

"In regard to the second resolution, relating to representation by the manufacturers on the various committees associated with the operation and management of the A.G.A. Laboratory, it is the recommendation of the committee that each product division, who submit appliances or equipment to the Laboratory for approval, appoint a committee to act for the respective product division on approval requirements.

"It is also the recommendation of the committee that the Chairman of each of these committees, representing each product group, constitute a general laboratory committee to cooperate with the A.G.A. Management Committee on any matters which require cooperative action."

Justified Optimism

WITHOUT confidence in one's ability to forge ahead, an individual is woefully handicapped. Nature may have endowed him with all the qualifications of greatness, even genius, but if he lack that fundamental attribute of success, self-confidence, he probably never will win through.

What is true in the case of the individual, applies with even greater force to an industry for there success is dependent in a very large measure on the general stamina of the organization as a whole, and as the chain is as strong only as its weakest link, so the esprit de corps of any company may be entirely undermined through the inefficiency or lack of esprit de corps on the part of even a small minority of its employees.

Thus it is with the Gas Industry today. Nearly all the companies engaged solely in the production and distribution of gas, having only a single master to serve, are doing sterling work in promoting the welfare of the industry, and the gas divisions of most of the so-called combination companies are also aggressively pushing the sale of gas. Unfortunately for the prosperity of our industry there seems to be a small group which is not, or prefers not, to be convinced of the future success of gas. This element frequently asks whether gas can meet successfully the competition of other fuels, particularly that of electricity, and, leaving the question unanswered, subconsciously tends to instil in the minds of others, a doubt as to what that answer should be.

In many instances the executives of such companies have been trained in the electrical field and are dazzled by its expansion and intrigued by its romantic background. They are so steeped in electricity that it is exceedingly difficult for them to face gas problems with dispassion.

We regard it as fundamental that equity and sound business sense demand the use of gas in both the residential and industrial fields where it is the efficient and economical fuel.

No employee of the gas department of the combination companies need have any fear for the survival or the progress of gas if all strive faithfully and enthusiastically to promote the use of gas by every legitimate means, remembering that gas can compete with other fuels in every branch of the domestic field, and that in the sphere of cooking and heating it should be supreme.

Let us lay it down as a basic principle that the gas industry has no valid reason to doubt the future. Its economic position is fundamentally sound, and never has its outlook appeared brighter than at present. It is indeed a proof of the soundness of our great industry that it has been able to weather so splendidly the most abrupt national economic readjustment that has ever shaken the country. While competition with other fuels still exists it can be stated with assuredness that gas is not only holding its own but rapidly gaining ground.

We have emerged from the depression a greater and a more efficient industry, and better prepared than ever to carry on. There is a vital need, nevertheless, for the formulation of a sound, far-reaching policy for the future, which not only will provide for a solution of the many and complicated problems of the present, but anticipate as far as is humanly possibly those that the future may bring forth.

Such a policy should be logically conceived and adequately balanced, with both the needs of the public and the welfare of those engaged in the production and distribution of gas impartially considered.

This will demand the best thought and the most energetic action of all the industry, thinking and acting with a single impulse for the common good. There must be, too, absolute cooperation between employer and employee, which should be relatively easy of achievement, for in no other business, perhaps, is the success of both so interdependent.

The gas industry is one of the most important in the country. It is confined to no one section, but affects tremendously the entire economic scheme. In its great and widely distributed operations thousands upon thousands of skilled and unskilled workmen find remunerative and steady employment, and so far-flung have become its ramifications that today many other industries depend upon it, in measure at least, for their own prosperity.

GAS men who had the good fortune to attend the joint Annual Convention of the American Gas Association and the Association of Gas Appliance and Equipment Manufacturers, must have been extraordinarily inspired by the various exhibits, particularly those of the appliances, which, in efficiency and appearance, are the equal, if not the superior, of any on the market today. No one who inspected the exhibits could fail to leave Atlantic City with a strengthened belief that Gas is the ideal fuel, and that with the assistance of technical progress it will be able to meet competition from every source.

The Rate Situation

Alfred I. Phillips

Chairman Rate Structure Committee

During the past year the Rate Structure Committee has centered its attention on the rate problems arising from the ever increasing competition for the residential fuel business. The development of rates that will enable the sales department to secure and hold the maximum amount of profitable consumption in the face of competition is the outstanding problem of the rate engineer today.

It is axiomatic that rates should do two things: Provide an adequate revenue, and permit the maximum amount of business to be secured. Thus cost of service to the company and value of service to the customer must both be considered. The objective to be attained in designing and applying a set of rate schedules is (1) to cover the cost of service, including a fair return, and (2) to come within the value of the service for the maximum amount of existing and potential business, at the same time avoiding unjust discrimination among customers.

These two factors are not interdependent and are often conflicting. However, it is the province of the rate engineer to reconcile them and construct rate schedules which, taken as a whole, will reflect the cost of service, and taken individually, will meet the value of service to the maximum practicable extent.

It is not necessary and usually not desirable that individual schedules or parts of schedules should show the same rate of return. The propriety and wisdom in the public interest of acquiring gas business that cannot bear its full pro rata share of the cost but can stand full increment cost and some contribution to earnings has been accepted by most regulatory commissions as an established principle. Much the same may be said of existing business which is so keenly competitive that it cannot be made to yield a pro rata share of the earnings. Cost of service should be looked at from the standpoint of the company as a whole; value of service should be viewed largely in the light of competition for the individual type of business.

A. I. PHILLIPS

It is the considered opinion of the Rate Structure Committee that in most instances rate schedules can be designed which should be successful in meeting present-day price competition in the residential and commercial fields and in securing a substantial volume of industrial business. As far as practicable such rate schedules should meet directly and specifically the local competition in the particular field they are intended to cover. Class rates are peculiarly adapted to that purpose.

The use of class rates is increasing. The majority of companies now have special schedules for commercial and industrial business. Many have house heating rates based largely on incremental costs and competitive conditions. Rates for water heating and for various combinations of residential appliances have come into use. While class rates should never be adopted indiscriminately, the Rate Structure Committee believes they are a valuable weapon in meeting competition and recommends that the gas industry give serious consideration to their more general use.

Competition in the industrial and commercial field is based on relatively definite and measurable factors. Competition for residential business is far more complex. Comfort, convenience, prejudices and personal habits of individuals are vital factors. For some classes of business intangibles are apparently of as much importance as price.

A preliminary study by a subcommittee of this committee indicates that the volume of gas used for residential cooking is not greatly affected by the cost of the service. On the other hand, water heating consumption is substantially affected by cost; while for house heating, cost is the dominant factor.

Detailed knowledge of such trends as these should enable company managements to approach the question of residential rate adjustments and rate structures with increased confidence, and also aid in developing the extent and type of promotional activity for each class of such business.

In recent years it has sometimes been urged that the gas industry adopt a thermal unit of measurement equal or approximately equal to the electrical kilowatt hour. The prospective advantage would be that the cost of gas and electric energy would then be directly comparable and evident.

With few exceptions, thermal rates in the United States have thus far been adopted to facilitate the replacement of manufactured gas by natural or high heating value mixed gas. As a help in meeting residential competition they are still unproven. Any change in the existing unit of measure should always be undertaken with caution. On the other hand, the small thermal unit has theoretical advantages; and while not a panacea for our competitive problems, it may prove helpful in special instances where effort is made to stress the low cost of the electrical unit to the detriment of gas.

Objective type rates have thus far been adopted by about 20 gas companies in the United States. A schedule adopted in Baltimore in 1916 and used successfully for a number of years contained many objective features; but no other gas company has had an objective rate for as much as two years. The Rate Structure Committee, therefore, has

*Presented at General Sessions A.G.A. Convention, Oct. 28, 1936.

not yet felt justified in attempting to report specifically on their success. However, general reports indicate that objective rates have built up gas sales and that they are in fact one of the most promotional rate forms ever devised.

Much of the success of the objective rate has unquestionably been due to its form, which has appealed to the imagination of the public and has enlisted the support of the salesmen. Neither a low rate nor an attractive form of rate will of itself produce sales. But a well designed rate, well presented to the public, removes the bars to sales, and in itself tends to stimulate the other needed factors—salesmanship and customer satisfaction. The rate thus becomes an invaluable competitive weapon.

In conclusion, the Rate Structure Committee reiterates its unreserved adherence to the broad fundamental principles of rate making outlined in its past reports. Even under the changed conditions of today they are as sound and applicable as when first presented to the industry. The committee advocates their general recognition by gas companies and regulating authorities, and it urges that they be considered and intelligently applied in the fixing of every rate.

Study on Relation of Rates to Domestic Gas Sales

C. F. deMey

Chairman, Subcommittee—Rate Structure Committee

Increasing interest in this subject has been apparent during the past few years because of the continued pressure from various sources for adjustments of manufactured gas rates for the stimulation of gas company sales and earnings. Many manufactured gas companies have recently introduced high B.t.u. gas, either as straight natural or mixed gas, and are interested in adjusting rates to levels which will increase their sales volume. On the other hand, certain companies are faced with rising costs and may be forced to adjust rates upwards and are, therefore, concerned with the problem of preserving their net income with a minimum disturbance of their rate structures.

It is apparent that, if changes in sales which result from rate adjustments can be predicted, such information will be of great importance to company executives in planning their rate programs, not only as to the magnitude of changes contemplated, but also as to their character. In addition, since such knowledge is, after all, based on the customer's appraisal of his needs and the value he places on gas service, gas company customers should benefit to the extent economically possible as a result of the application of this information in developing rate structures within regulatory limitations but reflecting customers' requirements as much as possible.

In 1935 the rate structure committee presented certain average relationships between gas rates and sales which made no attempt to indicate other than the general trend of residential sales with respect to variations in the average rate charged. The present study has been carried forward to a point where the three major residential gas uses —cooking, water heating including other base load and all space heating —have been segregated and variations in sales of each with respect to rates have been estimated. This segregation has been used and has been found in practice to give the required flexibility for determining proper rate forms as well as to predict variations in sales caused by rate changes. At this time, due to relatively low saturations, refrigeration service has not been segregated and such sales are considered to be included with water heating.

Note: *The following study by this subcommittee is a preliminary effort to find a general relationship between price and sales and a possible trend of sales on change in price. It is hoped the information here presented will lead to full discussion and disclose any further data which may be available on the subject. It is anticipated that the committee will continue this research in the future. The data are tentative only and subject to revision and refinement in the light of additional information and research.*

It is not to be expected that sales can be increased or decreased by a rate change alone since this is only one of a number of important contributing factors. General experience indicate that, if all other factors affecting sales remain constant, variations in sales due to a rate adjustment require from three to seven years for full consummation. This relatively long period is indicative of the natural reluctance of the public to change established habits and is often encountered by others when new products or changes in established lines of merchandise are introduced. Sales promotion activities coordinated with rate reductions can, of course, shorten this period considerably, and from past experience such coordinated activities are productive.

In general, the relationships developed in this preliminary study should assist company managements to approach the question of domestic rate adjustments and rate structures with more knowledge of their contribution to changes in sales volume independent of all other contributing factors and, in addition, aid in measuring the effectiveness of other activities for the promotion or retention of sales volume.

Average Relationship Between Rates and Sales

Chart A has been prepared to illustrate general trends only and to contrast the relative market elasticity of the three major classes of domestic gas sales.

It will be observed that the differences in cooking sales at various rate levels are much smaller than for either water heating or space heating.

This increase in gas used for cooking with decrease in rate, even

though relatively small, is perhaps the most interesting feature of the chart since this would indicate that an increase in home cooking results from lower gas rates. This may be true to some extent but a more reasonable explanation is that greater wastage of gas occurs as rates are lowered. The customer is not only less careful in his operation of the range but also less attention is paid to burner adjustments. Consequently the range operates at lower efficiencies and gas is used which otherwise would be conserved.

Water heating consumption per average customer increases considerably with reduction in rates, not only as a result of less economical use, but also because of the larger number of customers who can afford this service as the price is reduced.

Another factor is that water heating equipment in communities supplied at rates of six cents and less per therm may be less efficient than where higher rates prevail, thus resulting in a larger consumption of gas for equivalent hot water service.

All space heating varies even more than water heating, not only because of the variations in number of customers who will avail themselves of gas heat, depending upon their individual economic status, but also because of the highly competitive market conditions under which space heating is sold.

The April 1936 report of the 1935 House Heating and Air Conditioning Committee on the Economics of Gas House Heating develops the economics of central house heating sales quite fully; consequently, this subcommittee has confined itself to showing only general trends taken from companies having long established house heating loads, including both central fired and incidental house heating sales.

It will be noted on Chart "A" that, in connection with the trend of house heating sales, the average degree day deficiency and competitive fuel prices have been specified. These factors are essential for interpretation of the house heating sales curve, because central fired house heating sales are influenced directly by the amount of the annual premiums paid over competitive fuels rather than by the gas rate. On the other hand, incidental heating which is included in the values shown, is influenced largely by the rate charged.

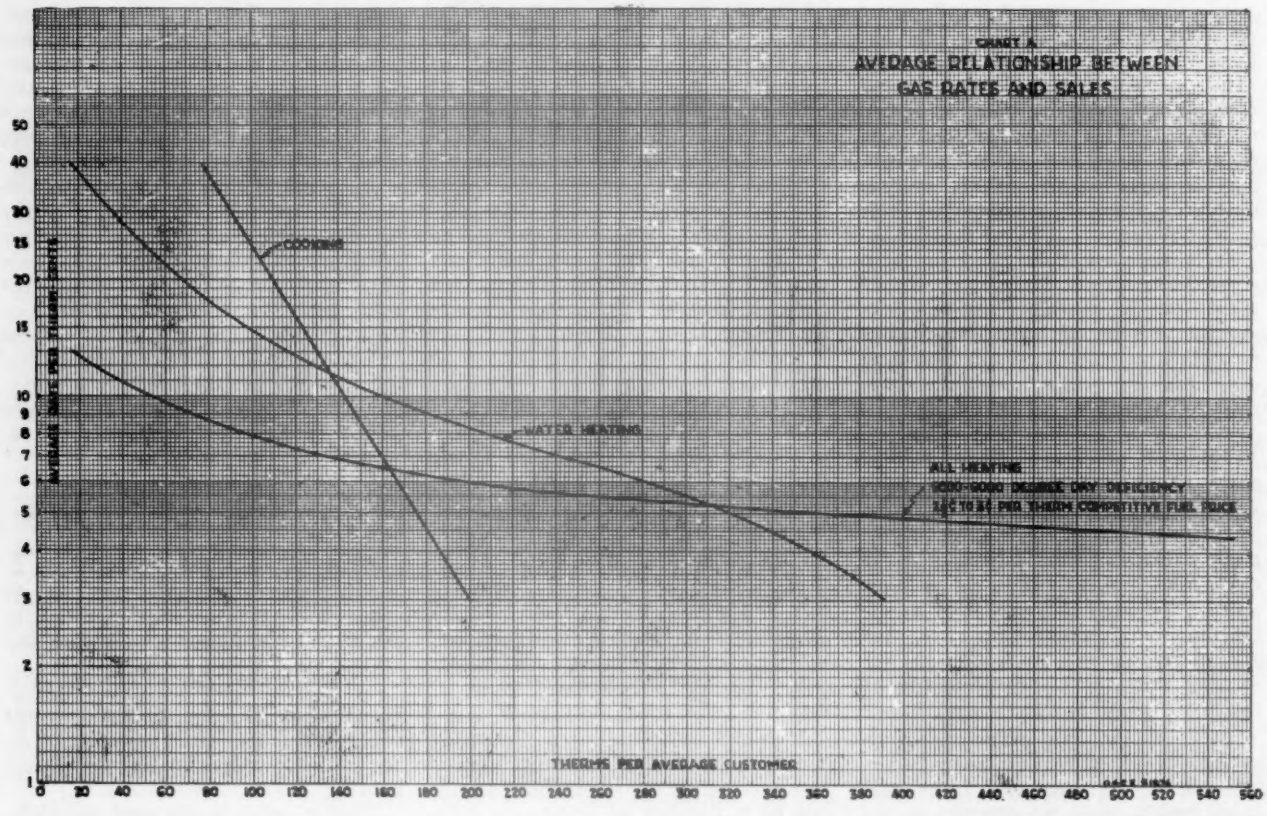
In view of the above described characteristics of heating sales, and, because of the material available in the House Heating and Air Conditioning Committee Report, no further reference will be made to this class of service. Further studies in collaboration with the House Heating and Air Conditioning Committee would seem desirable in order that a general relationship between house heating sales and rates will be available during the coming year.

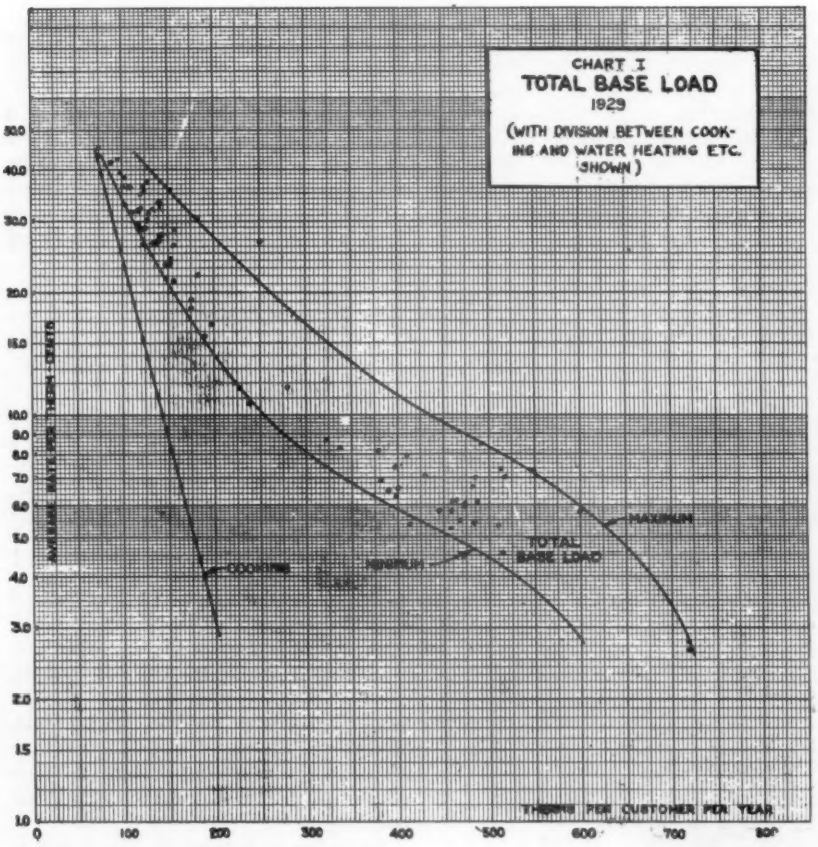
A necessary assumption in the interpretation and use of the curves on Chart "A," together with those which follow, is to consider them as trends rather than actual relationships. Thus they do not represent the experience of any one community but only the average change in sales following a change from one rate level to another. Each community, with its own peculiar characteristics as to customers' attitude, spending capacity, competitive fuel prices, types of residences, climate and sales promotion policy of the local gas company, has its own cooking and water heating curves.

Base Load—Charts I and II

The various points shown on Charts I and II were obtained from manufactured, natural and mixed gas systems serving approximately 2,000,000 residential customers analyzed by districts and communities varying in size from 100 to 275,000 customers.

The rates and therms were obtained from actual billing results, for the years, shown of residence





service by one of two methods:

1. In communities where scarcely any variation in M cu.ft. usage per customer occurred between the summer and winter months the entire load was considered as "base load."

2. In communities which indicated greater M cu.ft. usage in the winter months than in the summer months, the "base load" usage was estimated from the sales per customer experienced during the months of July, August and September, thereby segregating this load from any heating load, whether central fired or incidental.

The division of base load sales between cooking and all other base load (which for convenience is termed water heating, etc.) is based on studies of various groups of customers and appliance surveys which gave relatively consistent results as to gas cooking requirements at various rates.

The cooking requirements of customers in communities not having large apartment house saturations are quite uniform since this class of service is used practically by every residential customer and variations in use are limited by the nature of the appliance as well as its use. While racial characteristics and cooking technique affect the amount of gas consumed, so far there is little evidence to show that these factors are of great importance.

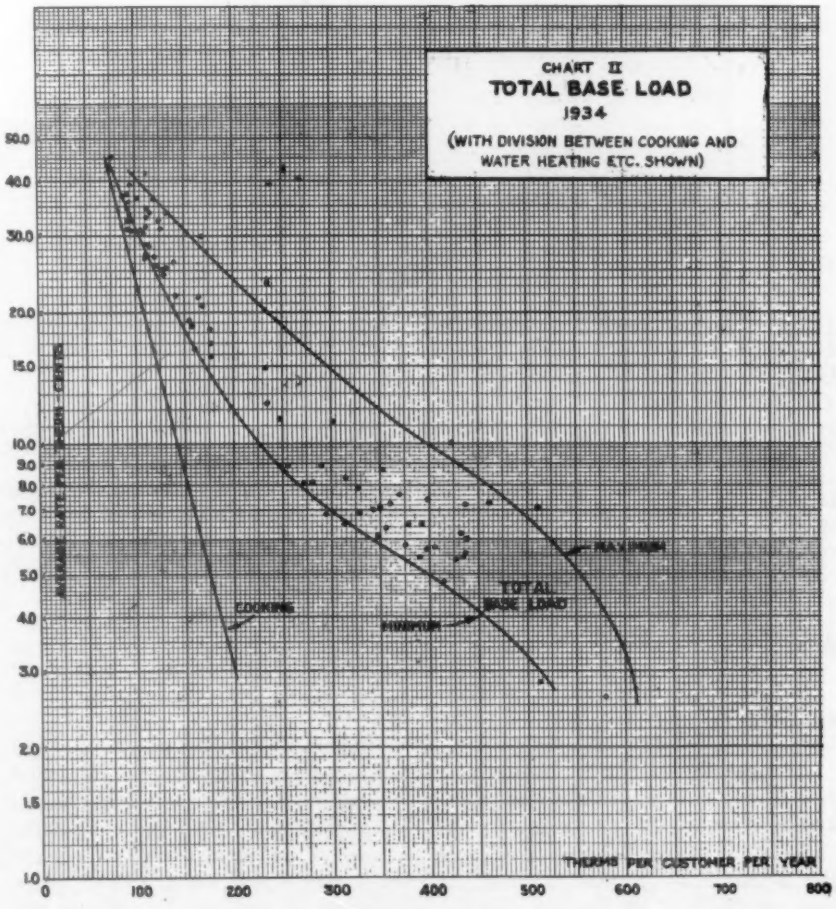
An extremely accurate division between cooking or range sales and other base load is not essential to get useful results since the curves are primarily trends rather than actual relationships. In other words, the trend of the cooking curve is more important than its intersections with the coordinates.

Having established the trend and average location of the cooking curve, the water heating, etc., sales have been taken as the remaining base load sales.

Charts III to V, inclusive, show the cooking and water heating, etc., curves plotted individually, together with the annual revenue expected for values of sales shown.

The revenue curves are merely the products of the rate and therm coordinates of the maximum and minimum sales curves and are, therefore, mathematical derivations from the original data used in obtaining the relationship between rates and sales.

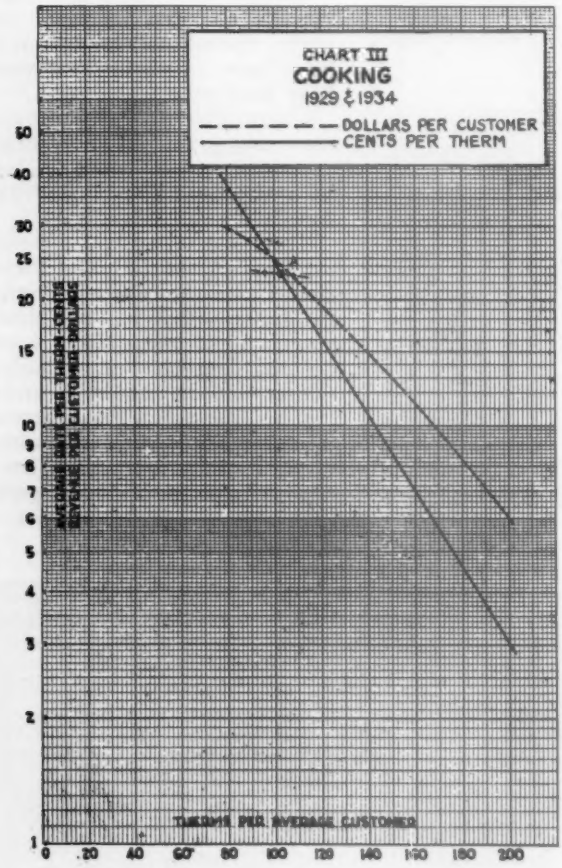
It will be noted that intermediate trend curves have been plotted for water heating, etc. This has been done in order to provide a guide for trend curves for individual com-



munities which, as previously explained, have their own individual characteristics.

It was thought unnecessary to plot more than one curve for cooking as the variations from the normal, as previously explained, are small.

In order to show the effect of the business depression on the trends, 1929 and 1934 values have been carried through the whole analysis.



It has been assumed that there has been no change in cooking, hence both 1929 and 1934 cooking curves are identical. Since there undoubtedly was a curtailment of cooking sales between 1929 and 1934, this assumption has a tendency to increase water heating a small amount in 1929 and decrease it in 1934, but, as only trends are of interest, this assumption does not incorporate a serious error in the curves.

Application of Curves

Before proceeding with a detailed explanation and example showing how the curves may be used to forecast the effect of rate changes, a few words as to the rate factors used are of interest.

As pointed out above, the total the actual rate in this manner, as the distribution of consumption at base load rates plotted have been determined from the actual billing results, hence they are weighted average rates. If these actual revenue amounts were lacking, they could only be reproduced by application of the rate charged to a bill analysis of the usual type. Since it is necessary to compute rates per therm for varying sales, obviously it would be impractical to predict various sales is unknown or at least difficult to estimate unless analyses of communities at various annual consumptions per customer are available.

In order to eliminate this particular difficulty, the estimated billing of the *individual customer* has been found to be reasonably accurate to use.

Since the differences which exist between this latter computation and the actual values are of the same magnitude and direction within the range of sales ordinarily encountered, they practically cancel when increases or decreases in revenue and sales are computed.

The following example illustrates the use of the individual customer rates and also shows how the special water heating, etc., sales curve for a given community is developed.

Assume that the community to be studied has a base load consumption of 180 therms per average customer in 1934 and is now on the following rate:

First 5 therms per month @ $.25 per therm
Next 15 therms per month @ .20 per therm
Over 20 therms per month @ .15 per therm
Minimum Bill—$1.00 per month

Cooking Curve

Since no definite knowledge of actual cooking requirements is available, for the purpose of this example, the cooking curve for the community in question is assumed to be the normal curve as plotted. A point is, therefore, found on this curve representing the cooking usage of the community at the rate charged for cooking.

In order to determine this point, it is usually necessary to apply the empirical method of assuming a number of consumption values and determining the average rate for each until finally the proper consumption is obtained which will give values intersected by the curve.

For example, if we assume that the cooking usage is 96 therms per year or 8 therms per month, the average rate will be computed as follows:

First 5 therms per month × 12 =	60 therms @ $.25 =	$15.00
Next 3 therms per month × 12 =	36 therms @ $.20 =	7.20
Total	96	$22.20

Average rate = $.231 per therm.

The point 96 therms at $.231 per therm will be found to fall to the left of the curve, hence the trial value of 96 therms is low.

If we now try 9 therms per month or 108 therms per year, going through the above calculation, the rate is determined to be $.228 per therm. This point falls to the right of the curve, hence this trial value is high.

If a straight line is drawn between the two points its intersection with the curve should be close to the correct value. Having done this, the value 103 therms per year or 8.6 therms per month is obtained, which results in the following average rate:

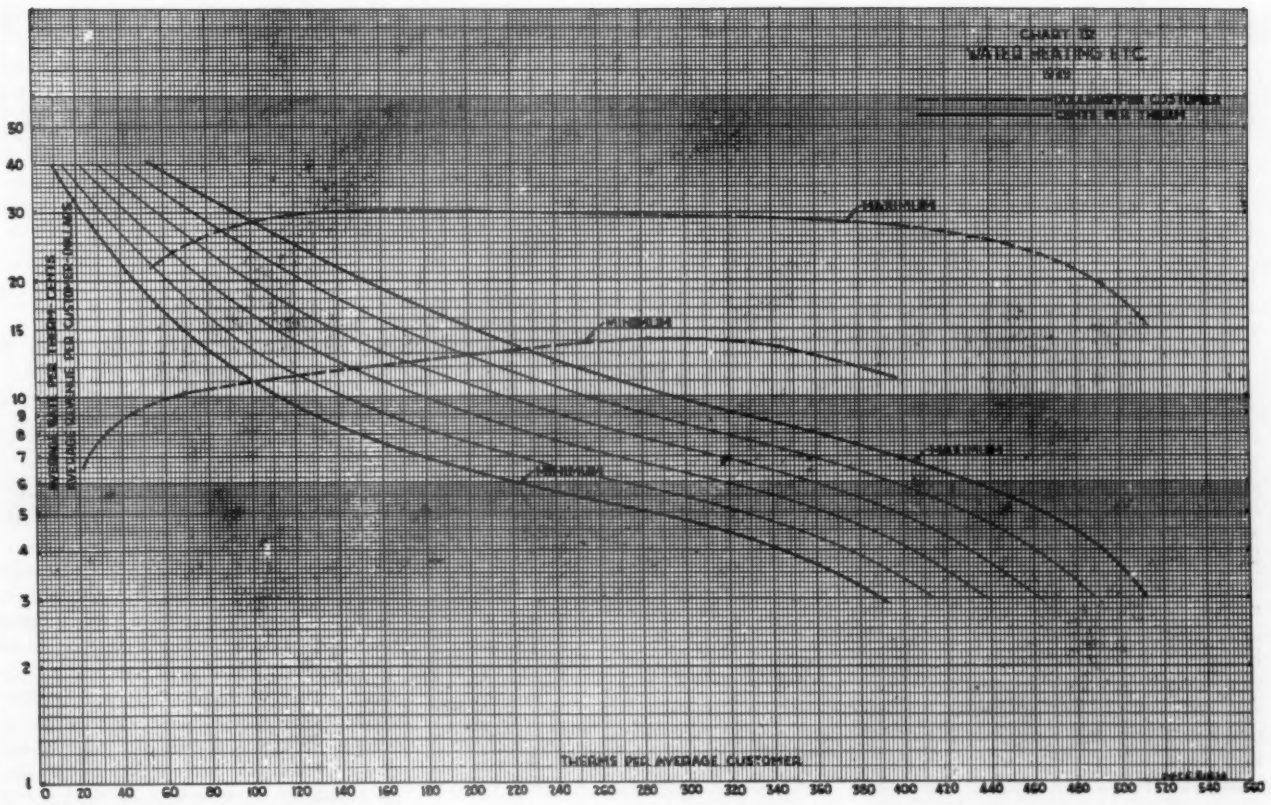


CHART IV
WATER HEATING ETC.
1929
THERMS PER AVERAGE CUSTOMER
0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300 320 340 360 380 400 420 440 460 480 500 520 540 560

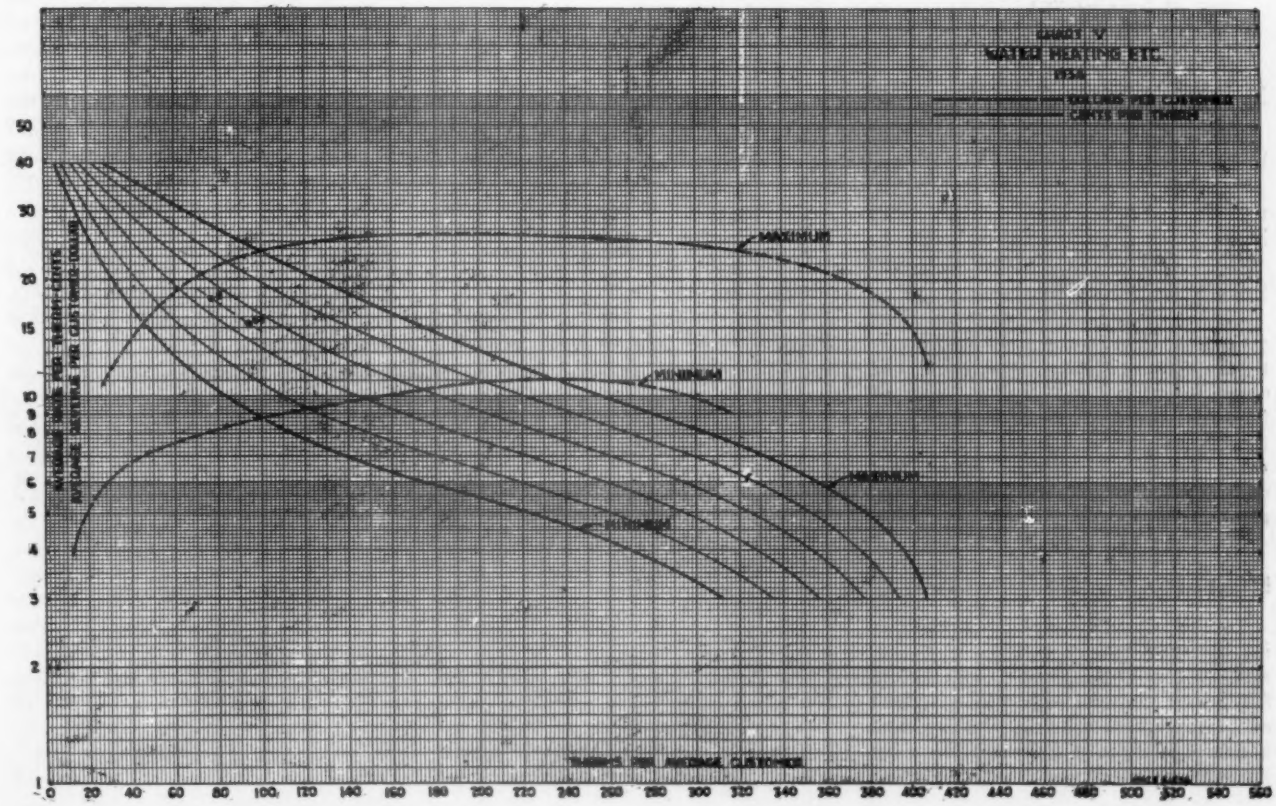


CHART V
WATER HEATING ETC.
1936
THERMS PER AVERAGE CUSTOMER
0 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300 320 340 360 380 400 420 440 460 480 500 520 540 560

First 5 therms per month × 12 = 60 therms @ $.25 =		$15.00
Next 3.6 therms per month × 12 = 43 therms @ $.20 =		8.60
Total	103	$23.60

Average Cooking Rate $.229 per therm.

The point designated as (A) on Chart III, 103 therms per year at an average rate of $.229 per therm falls on the cooking curve, and, therefore, is probably close to the actual cooking requirements and rate of the average customer.

Water Heating, Etc., Curve

For water heating, etc., an initial assumption must be made as to the consumption for this usage by the individual customer. Such an assumption should be based upon a knowledge of the types of water heaters in general use in the community and an estimate of the average monthly consumption of these heaters. If we estimate 20 therms per month or 240 therms per year for *each* water heating customer, under the above rate schedule the average rate for purely water heating usage then is calculated as follows:

15 therms (amount in the $.20 block) minus 3.6 therms (Previously used up in $.20 block for cooking)	= 11.4 therms × 12 = @ $.20 per therm =	137 therms $27.40
20 therms (Total water heating usage) minus 11.4 therms (Charged for at $.20 above)	= 8.6 therms × 12 = @ $.15 per therm =	103 therms $15.45
Total		240 therms $42.85

Average Water Heating, etc. Rate = $1.79 per therm.

Since our community has a total base load consumption of 180 therms per *average* customer, of which 103 therms is the cooking load, the water heating, etc., consumption will be 180 — 103 = 77 therms per year per *average* customer.

Now we can plot the water heating point at 77 therms and $.179 per therm (Point "B" Chart V). The curve drawn in dashed lines through this point and parallel to the trend curves then represents what may be expected from this community for water heating, etc., at various rates for this usage alone.

Effect on Sales of Change in Rate

In the above example, cooking gas is paying a rate of $.229 per therm and water heating, etc., a rate of $.179 per therm. For the purpose of this example we may assume that a decrease in rate for water heating is contemplated and that the new rate for this service must be computed, which will fall on the sales curve of the community at the new sales point.

The problem essentially involves the intersection of the sales curve passing through point "B," and the new rate computed for 240 therms per individual customer, as follows:

5 therms — 3.6 therms = 1.4 therms × 12 =	17 therms @ $.20 =	$3.40
	223 therms @ $.15 =	33.45
Total	240 therms	$36.85

Average rate = $.154 per therm.

Point B-1, on the dashed sale curve at $.154 per therm, will then give the expected sales at the new rate. Reading from the curve gives sales of 94 therms per *average* customer.

Thus the effect of the lower water heating rate will be a gain of 94 — 77 = 17 therms per year per average customer.

The change in revenue per averager customer will be as follows:

Old rate — 77 × $.179 =	$13.78
New rate — 94 × $.154 =	$14.48
Increase	$ .70

rate will be as follows:

First 5 therms per month @ $.25 per therm
Next 5 therms per month @ .20 per therm
Over 10 therms per month @ .15 per therm
Minimum Bill—$1.00 per month

Cooking

Obviously, no change has been made in the rate for cooking gas so that no change should be predicted for those sales.

Cooking gas will, therefore, remain at $.229 per therm for 103 therms.

Water Heating, Etc.

Since the rate for water heating, etc., gas has been decreased by changing the length of the $.20 block from 15 to 5 therms, a new average

Since a larger amount of gas is sold, the increase in net income will be less than the above by approximately the increment cost of additional gas sold.

As previously described, it is unreasonable to suppose that the above changes in sales, revenue and income will take place immediately or that they will be clearly defined in operating results. There are many other factors which will affect the sales of water heating, but, of the total changes which take place after the rate change is made, it would seem that the above amounts could be attributed to the decrease in rates and the balance to other factors such as sales promotion activities, changes in economic conditions, etc.

In conclusion, the subcommittee suggests that gas companies apply the methods and principles described in this study in order that points which have not been covered may be developed in subsequent work of the Rate Structure Committee and that refinements may be made in the data and calculations given in this study.

The subcommittee wishes to express its appreciation to the companies who have furnished the data and other information which have aided materially in developing this study.

Radio Communication to Mobile Units for Normal and Emergency Dispatching in the Operation of Public Utilities

K. Kendall Berlyn

Northern Indiana Power Company, Kokomo, Indiana

Synopsis

The Need for Radio Facilities—Advantages—Service Interruptions—Observations Pertaining to the Time Element Incidental to Interruptions—Responsibilities Placed upon Utilities Due to Variety of Loads—Most Common Causes of Interruptions—Emergencies—Public Safety — Dispatching by Radio for Normal Operations—The Development of a Selective Radio Calling and Signaling System — Comparison with Police Systems—Advantages of the Selective System—Operating Characteristics — Technical Description — Field Tests—Final Development — Availability — Factors Determining Choice of System —Estimate of Initial and Maintenance Costs — Federal Communications Commission Requirements — General Interest by Utility Industry—Concluding Recommendations To Secure Wave Length Allocations.

THE recent disasters, such as the flood at Pittsburgh, the Georgia sleet storm, and the Florida hurricanes, have emphasized the need for radio facilities in dispatching repair crews and accelerating restoration of service to the stricken areas. These catastrophes have placed a definite value on radio for such services and is being vigorously demanded by those companies which are located within the affected areas. Other companies, not likely to be affected by such conditions, have become interested in radio as a means of minimizing the time of interruptions and other problems particularly peculiar to their operations.

Due to the transient character of the operations of repair crews, it becomes extremely difficult to contact them upon short notice by any other means than radio.

In recent years the loss in revenue due to service interruptions has not been the major consideration of public utilities. The varied and indispensable uses for which gas and electricity have been employed makes service continuity an absolute necessity. Otherwise, consumers such as large industrial plants, hospitals, foundries, telephone exchanges, and electric hatcheries sustain huge losses, which in the aggregate, may reach proportions many times the revenue loss in terms of cubic feet of gas or kw.hr.

The attitude which the typical utility man maintains toward service interruptions has been developed as a result of experiences which have seriously inconvenienced the consumer. The earnest efforts to restore service following outages is not appreciated by the general public nor the customers affected. There have been numerous devices developed to localize trouble on transmission and distribution systems to small sections. However, little progress has been made toward the prompt dispatching of repair crews to the location of the trouble. This is due almost entirely to the absence of communication facilities.

Assume that a construction crew is working a distance of fifteen miles from headquarters—a case of trouble occurs one mile from the crew. In this case it is necessary for some person to drive from headquarters to where the crew is located and inform them of the trouble. With radio control this unnecessary delay can be avoided, thereby greatly decreasing the time of interruption.

In the past, the Federal Communications Commission has confined the issuance of radio station licenses to those services which were classified as "emergency only" stations. Among these were aircraft and airport service, point-to-point telegraph and telephone, police radio, and maritime aides. All of these, when scrutinized closely, are intimately associated with governmental activity. According to the F.C.C. definition, an emergency exists when there is a "hazard to life and property." As has been pointed out above, the utilities are frequently confronted with conditions complying with this definition. However, the Commission has apparently not been convinced that these emergencies have sufficiently widespread effect upon the public to justify license grants for the purpose. In consideration of this attitude of the F. C. C., it is doubtful if the utilities could justify the investment necessary to install complete radio facilities for "emergency only" service. If radio facilities could be utilized for normal dispatching it would not only be the means of improving services to the public, but would accelerate services during emergency conditions from the familiarity and experience gained from accustomed use.

Difficulty in locating and dispatching crews during emergency conditions having been experienced by our company, prompted the thought of a more adequate means of control. Radio naturally suggested itself for this purpose as no other known method is available for communicating with mobile units. With the conventional police system an attendant is always required to be in the car in which the receiver is located. Otherwise, calls would go unheard. This method could not be conveniently applied to power company use because one-man service and trouble cars dominate the largest proportion of the fleet operated. And generally drivers and workmen do not work sufficiently close to their cars to hear a radio. Therefore, it was necessary to devise some means to call drivers to their cars by some audible signal. It was the means for accomplishing this operation that the greatest portion of the time in research was spent, requiring almost three and one-half years. Briefly, it was proposed to blow the horn on the car or truck wanted which would attract the attention of the driver,

Presented at Technical Section, October 27, 1936.

thus, informing him that a call was awaiting him on the radio in his car. All know types of tuned audio frequency circuits were studied and attempts made to apply them to our problem. These were found unreliable due to their tendency to change frequency because of slight variations in voltage supply, temperature, and other conditions difficult to control. Combinations which worked perfectly under laboratory conditions were abandoned when found to alter their response characteristics when exposed to such changes as that from winter to summer temperatures. A radically different circuit was finally developed.

Prime Object

The ability to call one car at a time rather than the entire fleet was the prime object sought. For instance, should a utility operate fifteen or more cars equipped with receivers, it would be entirely unnecessary to call all of them when but one or two, at the most, would be needed. Attention is here directed to the point that the selection of the individual trucks was accomplished using but *one* carrier frequency (wave length). Under the past conditions of radio transmission selectivity of individual receivers could have been accomplished with little difficulty by the use of a number of radio frequencies. However, it would be unreasonable to hope that more than one radio frequency would be assigned by the F. C. C. as the bands are over-crowded at present and no new frequencies would be granted without extensive proof of the necessity for such grants.

The radio system developed by our company is summarized by the following points:

1. A signal to attract the attention of the car operator.
2. Immunity from temperature variation.
3. A selective feature to permit the calling of any one car wanted from a large fleet utilizing but one carrier frequency.
4. Freedom from interference due to lightning, power lines, and other radio stations.
5. Freedom from "blanket" effects, which would tend to produce false signals to cars close to the transmitter when a more remote car is signaled.
6. A simple and reliable supervisory system assuring dispatcher or operator of correct transmitting conditions.
7. An equally simple receiver free from adjustments while calls are in progress.
8. Standardized equipment and parts.
9. Costs, in terms of capital investment, operation and maintenance, are such that the system may be widely adopted.

As an optional signal instead of the horn blast, a light behind a red bull's eye is located in the cab of the truck. This visual signal is intended for use while drving, and when parked near hospitals or quiet zones. Either of the above types of signals would be followed by instructions or orders by voice, which would be received in the usual manner.

The transmitter or station used is similar to all those used for police and broadcast purposes. Integral with, and attached to the speech amplifying equipment, is an audio frequency tone oscillator. The circuit and basic principle utilized in this oscillator and another of identical characteristics connected to the receiving equipment are now pending patent. It is to this development that the system owes its success. This oscillator produces perfectly stable audio frequencies at any selected value between 1,000 and 2,000 cycles per second. Each receiver is adjusted to receive some frequency within this range. In operation, the frequencies are automatically determined by a pre-selector controlled by the station operator in a manner as simple as placing a call on an automatic telephone system. The truck numbers are arranged on the control panel and above each of the numbers is a small indicating light. There is a dial similar to those used for telephone work. To the right of the dial is a switch for restoring the selector switch to normal position. At the left of the dial, the master switch controlling the current supply to the station is located and directly below the dial there is a push button which controls the station carrier. This button, when pressed, puts the station "on the air."

We shall now assume that a call is to be made to truck number 938 and describe the operations of transmission and reception. To call truck 938 the operator will move the left hand switch to the "On" position. This energizes the transmitter and control apparatus. A supervisory lamp on the control panel indicates to the operator that conditions are proper to proceed. The operator dials No. 9-3-8. A light then indicates over the number 938, showing that the selector mechanism functioned properly and no error occurred in dialing. He then presses the push button below the dial, transmitting the signal. This operation starts the horn blast on car No. 938. The signal transmitted from the station is on the air for only one second, but the horn on the car will continue to blow until stopped by the driver. Following the transmission of the initial signal at the station the operator waits a length of time sufficient for the driver to reach his car. Tests have shown that one or two minutes is ample in the majority of instances. After this brief pause the operator depresses the microphone key and proceeds to issue instructions in the customary manner.

The calling of a car consumes little more time than placing an ordinary telephone call.

Radio Locked

The receiving set used on the car is a standard automobile radio altered slightly to adapt the control arrangement and permit tuning to the proper wave length. Once the radio is installed in the car and tuned to the proper wave length it is locked in that position and both volume and tuning controls removed. This confines the use of the set to the purpose for which it was intended and obviates the necessity for manipulations by the driver that may lessen dependability. A control box is connected to the receiver through a metal sheathed cable and attached to the dash of the car. This cable connects to both the receiver and control box by a multiple contact plug which can be instantly disconnected thereby facilitating the removal of either part for servicing or replacement. This feature eliminates the possibility of detaining a truck when the set is in need of attention. Within this control box are located the master switch for turning the receiver on and off, a three position switch for the optional reception of the signal, namely: horn, speaker or bull's-eye and a push button for interrupting the horn blast.

When drivers leave headquarters and enter their cars it is only necessary to turn the receiver on with the master switch and move the three position key up or down depending upon the manner in which the signal is to be received.

Let us see now how a call is received. A workman is on some part

of the distribution system. Nearby his truck is parked. The master switch is in the "On" position, the middle key is in the lower position. Suddenly the horn of the car starts and continues blowing. The man hurries to his car. He then pushes the button on the control box stopping the horn blast. The middle key is then moved to the center position which places the speaker in operation. The voice of the dispatcher announces an emergency which requires the attention of the man listening. At the close of the announcement the workman moves the key to its original position preparing the set for the reception of another call, and proceeds at once to the scene of the trouble. During the call above described, other cars equipped with the same devise had no knowledge that a call was made.

No moving parts or mechanical devices are used on the receiver. The selectivity feature is made possible through the use of an audio frequency circuit revolutionary in design. The adjustable tone oscillator at the transmitter produces an audio frequency which is superimposed on the station carrier. This frequency from the transmitter is synchronized with the frequency produced by the oscillator attached to the receiver. If the incoming frequency is of the same value as that of the receiving oscillator, the two will be pulled in phase, thereby, actuating a relay. A time delay feature is introduced into the circuit by varying the capacitance. This time delay can be adjusted from an instantaneous value to one minute. It is this feature which makes the device impervious to static and other forms of interference. One second time delay has been found practical for our purpose and no interference of a completely stable nature would remain in equilibrium nor time phase for this length of time.

This circuit has an extremely critical audio frequency response which heretofore has been impossible to approach. This is obtained without sacrificing any sensitivity to the reception of the radio signal. The auxiliary oscillator when attached to the receiver requires less than 1 ampere of current drain on the car batter. This device has been given over 1,800 tests in the field with varying distances up to forty-six miles from the transmitter using 150 watts of power output without a failure. These tests have been conducted over a period of six months during all conditions of weather. All tests throughout the development of this system were made through the facilities of an amateur radio station. In the beginning when uncertainty prevailed as to the outcome of the experiment it appeared unnecessary to make application for a commercial station license. It will be necessary, of course, to obtain license from the Federal Communications Commission before the system can be used.

The complete radio selective system has been condensed in size and the appearance improved over the first models by the Radio Relay Corporation for the purpose of ultimate production. Quantity production of the device is awaiting the decision of the F. C. C., which body received applications for wave band assignments from the utility industry on June 15.

Cost Figures

Actual cost figures on a complete radio system as has been described have not been established. However, estimates have been prepared which are thought to be reasonably accurate. The cost of a radio phone transmitter will vary with the power in watts. It is thought that 50 to 150 watts of power output is sufficient for a coverage of from 10 to 25 miles. A station of this power equipped with the selective system will vary in cost from $800 to $2,000. If the station is erected by the personnel of the utility organization the lower figure will prevail and if the transmitter is purchased as a unit from a manufacturer, the higher value is probable.

The receiving equipment including the selective apparatus will cost from $127 to $150 per unit. If two-way communication is desired the overall cost will vary between $200 and $225 per set.

The operating and maintenance cost of the transmitter will depend upon its use. If the station is used for normal dispatching and the tubes are energized throughout the entire work periods of the day this will, of course, shorten the tube life and increase the costs. It is reasonable to assume that the maintenance cost for replacements, etc., for a low power station when put to severe use, should not exceed $100 per year.

The maintenance cost of the receiver will not be much in excess of a standard automobile radio. If the car is assigned to service which does not involve long driving periods an oversize generator may be required to keep the car battery fully charged. This would increase the investment about $35.

The Federal Communications Commission requires that all ardio stations obtain a license before any transmissions are made. The class of license obtained will depend upon the type of service to be performed. The station must also be provided with a means for controlling the frequency within the limit of that assigned with very little variation. It is further required that the station be operated by a licensed operator holding a license of the class required by the station service. As it is only necessary for the operator to be present during transmitting periods, this will permit the operator to assume additional duties. This arrangement would considerably reduce the operating cost of a radio installation by diverting a part of the operator's salary to other phases of operation.

Many of the larger utilities have been looking into the possibilities of radio as a means of control during emergencies. These investigations have led some of them to favor the ultra-high frequencies in the order of 5-10 meters. Others are favoring the longer wave length of about 100 meters. The ultra-high frequencies are not considered desirable for medium range coverage for distances of 30 to 40 miles. The longer wave lengths are more suitable for such distances; however, each spectrum has advantages over the other. The topography of the territory to be covered, the presence of tall steel frame buildings, mountains, etc., all are to be considered before deciding upon the spectrum to be used.

On June 15 of this year, the Federal Communications Commission began a hearing which continued for nearly two weeks thereafter:

"(1) To determine the present and future needs of the various classes of service for frequencies above 30,000 kc., with a view toward ultimately assigning such frequencies to services;

(2) to secure for the public and the Commission a keener insight into the conflicting problems which confront the industry and regulatory body in the application of the new frequencies to the service of the public."

* * * *

The Edison Electric Institute presented a brief at the hearing in behalf of the light and power industry. A staggering amount of evidence was offered by other groups which requested frequency bands

(Continued on page 84)

Time and Temperature Study

Ruth Soule*

The Brooklyn Union Gas Co., Brooklyn, N. Y.

(Introduction: It is difficult to standardize cooking to the extent of exact temperature and time for every food dish. However, it is possible to record a compilation of results from tests made by authoritative people representing various industries playing a part in food cookery. Therefore the following information deserves serious consideration if we as home service directors are to keep abreast of modern cookery methods).

—Beatrice Cole Wagner,
Chairman Home Service Committee.

THIS committee undertook this study with great reluctance, in view of the wide difference of opinion among authoritative people, most of whom never have an opportunity to foregather so that they may run tests and thresh out their differences, which might then turn out not to be differences at all. In view of these various opinions, the only course open to the committee is to present each opinion with whatever testimony we could gather, and let you make your own selection.

Baking Results Dependent on Type of Material in the Baking Dish

Claribel Adams of Washtenaw Gas Company, Ann Arbor, Michigan, has done extensive and recognized experimental work on the effect of pans of various material upon time and temperature requirements and upon baked products. Her report follows in full.

Pies

I have found 450° for 20 minutes and then 400° until done the most satisfactory temperature for two crust pies—regardless of the type of material in the baking dish.

1. PYREX—is a little slower at conducting heat, but when once heated, retains the heat so thoroughly that a higher temperature at the start would set the bottom crust quicker but would not cool down quickly enough to prevent the upper crust from burning.

2. LIGHT AND DARK GRANITE—bakes very satisfactorily at this temperature, giving an unsoaked bottom crust and well-browned top. Granite conducts heat quicker than pyrex and is very satisfactory for pies.

3. LIGHT TIN—is too reflective; have not found that it makes a satisfactory two crust pie at any temperature. When 475° was used for 20 minutes and then reset at 400° the top became burned but the bottom crust was still soaked.

4. ALUMINUM—also unsatisfactory product as the radiant heat is reflected more than is compensated by the higher conductivity and thinness of metal.

Cakes

1. TIN—as this is a mixture which contains sugar and butter and therefore browns at a lower temperature, I find tin bakes satisfactorily but is apt to have hot spots and therefore a bumpy product, due to poorer conductivity than aluminum. A darkened heavy tin is desirable for angel food as it gives a darker side crust.

2. ALUMINUM—makes an ideal cake baking material at a little higher temperature than granite or pyrex as it has better conductivity and tends to a level cake, delicately browned. Also on account of its reflective tendency the side crusts are more delicate and tender, which I consider desirable in a layer cake.

3. GRANITE AND PYREX—When baking a cake in granite or pyrex a correction of at least 25° lower should be made. Cakes baked in these materials are apt to be crusty.

Cookies

High side, light tins need a higher temperature setting as the heat is being both deflected and reflected. Too full an oven requires a higher temperature and tends to uneven baking.

1. GRANITE SHEETS AND BLACK TINS—these materials are both unsatisfactory for cookies at any temperature as they tend to brown the bottom of the cookie too much before the top is browned, due to the quick absorption of heat by the material in the sheets. The cookies baked on these materials have a different grain than those baked on light reflective sheets. Their use is not advisable but when used a lower temperature correction must be made.

Summary

Definite temperature corrections for different types of material in the baking dish cannot be given due to varying amounts of radiant heat in different types of ovens. Also due to the varying types of ingredients which are affected differently by heat. We can, however, say that in insulated ovens where there is always a large per cent of radiant heat a higher temperature is indicated when reflective baking dishes are used and a lower temperature indicated when materials which absorb heat—such as granite, pyrex and black tin are used.

Recommendations of Representative Home Economists' Meeting

A group of nationally known home economists met in Cleveland, with Dorothy Shank of the American Stove Company as chairman, in February 1936, to discuss various food and equipment problems. Each submitted information regarding her own product. The following points regarding time and temperature standardization were made:

1. Oven Temperatures and Terms Used

The American Home Economics Association has approved the following descriptions of oven temperatures:

Very slow	225-250	Moderately Hot	375-400
Slow	250-300	Hot	400-450
Very Moderate	300-325	Very Hot	450-500
Moderate	325-375		

2. Cheese Cookery

The Kraft-Phenix Cheese Company states that the term "brown the cheese," as in a broiled sandwich, should be eliminated in favor of "cook the cheese until melted," since high temperatures affect cheese unfavorably.

3. Meat Cookery

The National Live Stock & Meat Board recommends long, slow cooking for meat—300-350°. Meat may be seared if desired and if so it is recommended that a temperature of 500° for 20 minutes be used and 300° for the balance of time. However,

*Subcommittee—Home Service Committee.

there is more shrinkage in a seared roast.

The use of a meat thermometer is advocated.

A trivet in the bottom of the roaster should be used.

Roasts, except veal, should be uncovered during the entire period.

Do not baste meat, whether roasting or broiling.

Miss Willson recommends broiling at a constant low temperature (the oven heat control set at 350°, and the compartment pre-heated for 10 minutes). The meat is placed 3 inches from the flame and the door of the broiling compartment is left open. About 40 minutes will be required for a rare steak 2 inches thick. The flame may be increased for the last 5 or 10 minutes if a browner steak is desired.

(Note—These low-temperature broiling directions are very new and do not cover the separate broiling compartment. Many home service people still prefer the high temperature broiling method, by which the highest possible flame is used, the compartment preheated 10 minutes, the steak placed about one inch from the flame, and broiled approximately eight minutes on the first side and seven minutes on the second. Many home service girls also feel that the door of a modern broiling compartment may be left closed during the entire process because of smokeless broilers and improved broiler construction—R.B.S.)

4. Poultry Cookery

The Institute of American Poultry Industries recommends: In roasting poultry cover the bird for the entire period of roasting. Roast at 350° for 20-25 minutes per pound.

Do not baste, except for goose. Goose should be basted every 20 minutes with boiling water.

Broil the bird at a constant moderate temperature, on the skin side first, then turn and brush with melted unsalted fat and finish broiling; add butter before serving. (This recommendation is tentative, since insufficient work has been done).

The Bureau of Home Economics of the United States Department of Agriculture was consulted also as to directions for the roasting of poultry. They recommend, for a turkey a year or more old, using a cover on the roaster; for a younger fowl they use an open roasting pan. No water is used in either case.

Brown the bird one hour in an oven at 450° F. After the first 15 minutes, turn the bird with the breast down so it will brown all over. Reduce the oven heat to 325° F. For a 10 to 12 pound turkey this will take three hours. For a 15 pound turkey a year or more old, 4½ hours are advised.

For constant-temperature methods this organization advises that for young, well fatted chickens weighing from four to five pounds 325° F. has cooked them very nicely. For chickens less fat, weighing about three pounds, they suggest 350° F.

Other Temperature Studies

1. Cold-Start Cookery — At the conference of home economists at Cleveland, in the absence of extensive work done on cold-start cookery by its members, the following conclusions are based on their opinion only:

There does not seem to be enough fuel saving involved to advocate cold-start cookery.

There seems to be no time saved by this method as the time that is not used by preheating has to be added on to the end of the processing period in order to thoroughly cook the product.

(Note: Exception was taken to this by one of our committee members, who says that her experimental work has indicated that full time of preheating does not always have to be added on, and that in any case, gas is saved because preheated ovens usually wait for food—R.B.S.)

The subject of cold-start cooking is one upon which there is considerable disagreement, even among electric range manufacturers who first advocated it. It is conceded by everyone that it is perfectly satisfactory for some foods, but many home economists feel that its advantages are limited. Jane Roberts of the Roberts and Mander Stove Company spent eight months on experimental work on this problem, with very interesting results. She believes that this method of cookery offers a saving of time for the housewife, usually a saving of gas, and simplifies the baking operation without lowering food standards. Helen Diamond of the Minneapolis Gas Light Company, and a number of home service workers throughout New England are also enthusiasts.

2. Temperatures for Pastry—Another moot question is the correct temperature for baking pies. A few of our home service people are advocating low temperatures, with cold oven start optional. The large majority still favor the high temperature start, reduced as the pie filling requires.

References for Time and Temperature Study

We recommend the following pamphlets for reference on this subject:

1. Terminology Used in Food Preparation
   American Home Economics Association, Mills Bldg., Washington, D. C. 25 cents. (This contains a time and temperature chart, worked out by a committee of the American Home Economics Association).
2. U. S. Dept. of Agriculture, bulletins Nos. 17, 28, 39, 45, 81, 112.
3. Bulletins from the National Live Stock and Meat Board, 407 South Dearborn Avenue, Chicago.
4. Bulletins from the Institute of American Poultry Industries 110 N. Franklin Street, Chicago.

Apprenticeship

Dorothy Shank*

American Stove Company, Cleveland, Ohio

(Introduction: Frequent requests have been received from college home economics professors and graduate students of home conomics for information of educational nature that will help the home economist prepare for a home service position with a utility. With this thought in mind the system of apprenticehip has been studied. The following report clearly outlines some of the outstanding factors for and against such a plan.—B.C.W.)

The Aim of the Committee

To learn whether apprenticeships in gas utilities might be desirable and feasible, both from the standpoint of the college girl who has specialized in the study of equipment but has had no experience, and from that of the utility which prefers to employ a girl having had experience before she is given the responsibilities that accompany home service work.

Order of Procedure

The information desired was of a rather confidential nature. Letters were written first to several members of the committee who had tried such

*Subcommittee—Home Service Committee.

a procedure, and later to other members, to learn of their reaction to the desirability of establishing a cadet system for future home service assistants and to learn, if possible, what policies each company would establish in regard to such a procedure.

Conferences were arranged with professors in universities where equipment courses are taught. The problem of placing graduates who have majored in equipment studies is sometimes perplexing to these women. They train students, who find it difficult to secure home service positions because of their inexperience. The students are willing to put more time into the preparation for such work but where can such preparation be obtained?

Result of Inquiries

Of the replies received from service directors in the utilities to whom letters were written:

8 were in favor of the apprenticeship system

2 were in favor of the apprenticeship system (with reservations)

1 was not in favor

Advantages—from the Utility Point of View

It is possible to select suitable girls for future positions in the home service department.

Because it is a flexible arrangement it is possible to secure semi-trained employees quickly for temporary service when extra work requires.

It gives the company a chance to try out girls to see whether or not they will be satisfactory. If not, it shows the girls some of the problems of the utility—which helps to create good will and a better understanding.

Meeting the public helps to give the girls an adult attitude while in school.

It trains girls in the proper use of gas equipment.

Customers often admit a girl to their homes more readily than an older woman.

Many home service directors enjoy working with younger girls because they are open to suggestions.

It gives the girl a chance to see if she likes this type of work and is fitted for it.

The home service director can keep in touch with the college through apprentices and this is often desirable in informing the college on up-to-date equipment.

It stimulates alertness, accuracy and dependability in the student during her training period, with a tendency to make her eager for a position in the home service department.

Disadvantages—from the Utility Point of View

Too much time is used in training girls unless they are to be retained permanently and often quite a number must be trained to locate a few who can be used.

To prevent bad mistakes constant supervision is necessary.

It adds to the risk of bad public reaction which could be caused by any new employee.

The students should be on the company payroll in case of accident. Some companies are not willing to assume this responsibility.

Experienced girls are needed for field work.

Conflict with college class work is often a barrier to a practical working of this idea.

Students are not always sufficiently trained in foods work and its practical application and also need more demonstration work.

In many cases more equipment training is needed before apprenticeship is practical.

It is necessary that the student undergo a physical examination, even for a short period.

The student is not always acquainted with company policies and importance of good customer relations.

Advantages—from the College Point of View

Students are more interested in their courses when they are working during the time they are studying.

This proving ground helps students to know whether they are fitted for this type of work.

It stimulates alertness, accuracy and dependability in the student.

Disadvantages—from the College Point of View

A student sometimes becomes so interested that she prefers it to her studies.

The time often conflicts with class procedure.

Note: It is important for the right girl to be selected. A failure in this cadet system is largely due to the fact that the wrong personality has been selected.

Suggestion Received

The following constructive suggestion was made: Miss Olga Brucher, of Cornell University, suggests that a home service training course be established at the A.G.A. Testing Laboratory for these students so they can get from the gas industry first-hand information on home service work and what it involves. This course would be similar to that outlined by the Training Course Subcommittee. It could be taken during a summer vacation or after the student has graduated, as a first step toward an apprenticeship system.

Book Review

The Steel Physical Properties Atlas, by Charles Newman Dawe. 87 pages including 35 charts. American Society for Metals, Cleveland, Ohio. 1936. Price $2.50.

The "Steel Atlas" is an authoritative reference to the physical properties of popular steels and steel castings, as affected by carbon content, alloy content, heat treatment, tempering treatments and other influencing factors.

S.A.E. steels, cast steels, plates, rounds and 18-8 stainless steels and several of the new high tensile strength steels are included.

Those in the gas industry who are concerned with the heat treatment of steel and steel alloys should find this book valuable.

Engineering Alloys by Norman E. Woldman, Ph.D. Metallurgical Engineer, Eclipse Aviation Corporation and A. J. Dornblatt, Ch. E. Head of the Department of Metallurgy & Chemistry, U. S. Naval Academy, Postgraduate school, 622 pages. American Society for Metals, Cleveland, Ohio, 1936. Price $10.00.

Every important commercial alloy in the world is listed in this encyclopedia of 8200 alloys. The trade names, properties, compositions, uses and manufacturers of each are also given. This book should be in the library of anyone who is concerned with alloys.

Contents

Section 1.
Alphabetical list of 8200 Alloys.
Section 2.
Trade names, composition properties and uses of 8200 Alloys.
Section 3.
Typical uses for 8200 Alloys.
Section 4.
Alphabetical List of Alloy Manufacturers, and the alloys produced by each.
Sections 5, 6, 7 and 8.
Bibliography, unclassified alloys, and important conversion tables, definitions and miscellaneous information about metals and alloys.

Increasing the Capacity of a Large Diameter Natural Gas Transmission Line by Internal Cleaning with a Scraper

Frank J. Trelease

Ford, Bacon & Davis, Inc., New York, N. Y.

Introduction

THIS paper describes the development and construction of a pipe line scraper or go-devil for natural gas transmission lines and the successful use of such a scraper in 8″, 14″ and 22″ lines, with results which indicate that not only may the efficiency of a fouled line be fully restored by internal cleaning with such a device but also that the carrying capacity may be increased even beyond the original normal capacity for new pipe. The indicated increase of capacity beyond that normal for new pipe is believed to be brought about by the fact that the passage of a proper scraper through the pipe leaves the interior of the pipe in a smoother condition than that in which it is ordinarily received from the mill.

The development of the scraper described in this paper had its inception in the realization that the interior of the 22 inch pipe line transporting natural gas from the Amarillo, Texas field of Denver, Colorado was roughened and coated with corrosion products and with an accumulation of oil and dust and that it contained a considerable amount of water and oil, all with the result that its gas-carrying capacity had been materially reduced to such a point that the residual capacity was no longer sufficient to meet the expected peak demands, requiring that unless the capacity could be restored loops must be constructed or additional compressor facilities be provided. This paper describes how the carrying capacity of an 86-mile section of this line was increased from 85.9% of normal to 106.7% of normal by passing the scraper through it in only 11 working days without any interruption of service and with no out-of-pocket expense for labor, as the work was all done by the regular maintenance forces of the gas company.

In the fall of 1935 studies were begun covering the general problem of designing a scraper or go-devil to pass through natural gas transmission lines, and with particular reference to the design of an experimental scraper to be put through an 8″ line as the first step in the development of a scraper suitable for a 22″ line. Manufacturers of oil line go-devils were contacted but they had no suggestions to offer other than that the gas line be filled with water and that an ordinary oil line go-devil be pumped through it ahead of this water. Obviously such a procedure is not feasible with a natural gas line in service under ordinary conditions.

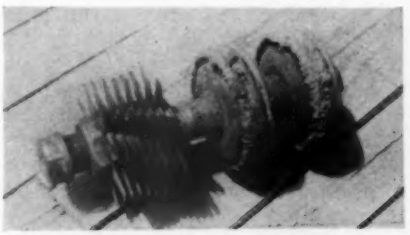


Fig. 1. 8 inch Scraper.

It was learned that the interior of a 20″ natural gas line in California had been cleaned by blowing steel shavings through it, but in spite of the apparent success of that operation it was not felt that such a method would be suitable for use in the Amarillo-Denver line because of the possibility of small shavings and chips of steel being left in the line and working their way into the numerous main line block-gates, and also because it was thought that the bundle of shavings would break up in a short distance and would not carry ahead of it any fluid which might have accumulated in the line.

The design of a go-devil for gas line entails numerous difficulties not encountered in oil line practice, particularly difficulties in the control of the speed of the scraper, which is not the same as that of the gas flowing through the line as in an oil line, and also difficulties in the removal of the loosened debris from immediately in front of the scraper so as to prevent clogging the line. This latter is of importance since the volume of material which might be cut loose by a scraper is of considerable magnitude, being sufficient to entirely fill a 22″ line solid for 15′ ahead of a scraper passing through only one mile of line containing a coating having only $^1/_{64}$″ average thickness. If this material were merely pushed ahead by the scraper it is quite probable that it would plug the line and it is therefore important that it be cut loose in a stream of high velocity gas moving past the scraper so as to carry the debris along well ahead of the scraper.

Eight Inch Experimental Scraper

The first scraper constructed was an 8″ experimental model consisting of a number of star-shaped cutter blades, separated by washers, which formed essentially a heavy metal brush to scrape the interior of the pipe, mounted on the front end of a 2″ pipe spindle or core, while on the rear end of the spindle were mounted a number of discs of rubber belting which formed a multiple squeegee to carry ahead any fluid which might be in the line. The 2″ pipe core of the scraper was open from end to end to permit the passage of gas through the scraper to carry ahead the cuttings and it was intended to regulate the quantity of gas flowing through the scraper by placing a suitable orifice on the front end of the spindle if it proved that too large a quantity of gas flowed through the open spindle. The cutter blades for this experimental scraper were made of 18 gauge hard rolled brass to minimize the possibility of striking sparks at the point where the go-devil left the pipe line. The assembled 8″ experimental scraper, which weighed 39 lbs., is shown in Figure 1.

After assembly this scraper was put through a short length of 8″ pipe line in the shop yard and later was tried out on a mile of 8″ field line. When first put through this mile of line the scraper pushed ahead of it an accumulation of ice, which was scattered all over the

Presented at A. G. A. Natural Gas Division, Oct. 26, 1936.

prairie but was estimated to have been about two barrels in volume, and also pushed ahead of it a barrel or two of water and gasoline as well as numerous pebbles, welding tears and other debris. In this first run the gas pressure behind the scraper was inadvertently built up quite suddenly to 80 lbs. per square inch and the scraper travelled the mile in 40 to 45 seconds, but aside from this excessive speed the first test run of the scraper was considered to be successful, as it demonstrated that a scraper could be driven through a gas line by gas pressure. The first run had cleared the line of all debris, ice and fluid and there accordingly was no danger of piling up a mass of debris in front of the scraper on a second run and consequently no need to pass gas through the scraper, and it was therefore decided to close the orifice and determine in the next test just what pressure was required to move the scraper through the clean pipe. The orifice through the spindle was entirely closed so that no gas could pass through the scraper. Gas was then introduced into the line and it was found that by feeding gas behind it slowly the scraper could be made to travel at an irregular slow speed at a pressure of generally 5 lbs. per square inch but at some instants building up to about 10 lbs. The time taken for the scraper to travel the mile was somewhat over five minutes as contrasted with less than a minute in the first test. These and other tests indicated that by regulating the pressure behind the scraper and controlling the rate of flow of gas into the line, the speed of the scraper could be controlled irrespective of the size of the orifice through it, and indicated therefore that almost any required quantity of gas could be passed through the scraper for the purpose of blowing ahead scale and debris.

These successful tests with the 8" scraper indicated that a practical 22" scraper could be developed, but they also indicated certain difficulties which must be overcome. The brass blades were found to be too soft to retain their shape and prevent excessive wear at their tips, and because of their softness did not efficiently clean the interior of the pipe. No indications of sparking were observed in the test runs, although numerous small pebbles and welding tears had been carried through the pipe ahead of the scraper, and it was accordingly decided that steel blades could safely be used. It was thought desirable to test an intermediate sized scraper before constructing a 22" scraper.

Fourteen Inch Scraper

A 14" scraper was next constructed, which was similar in design to the 8" experimental model, but was constructed around a 4½" outside diameter pipe core. The scraper blades were 16 in number and were constructed of tempered tool steel in the form of 12 pointed stars, the widths of the tips being such that all portions of the interior of the pipe, would be scraped by at least two blades. Squegee discs of rubber belting were mounted at the rear end of the core, as in the case of the 8" scraper. The front end of the core of this 14" scraper was closed by a solid pipe cap and a number of holes were bored in the core between the scraper blade assembly at the front and the rubber disc assembly at the rear, so that gas entering the open rear end of the core would flow out through these holes and around the scraper blades instead of merely straight through the core and out ahead of the blades as in the case of the 8" scraper. A circular baffle plate was welded around the pipe core a short distance back of the scraper blades to force the flow of gas around the periphery of the pipe and through the tips of the blades. A number of small runners were welded to the edge of the baffle plate to prevent the nose of the scraper or this baffle plate from catching on the interior joints of the pipe in the event the scraper blades were bent or broken, these runners being of sufficient length and so spaced as to ride over any interior joints. The assembled 14" scraper weighed 250 pounds.

This 14" scraper was successfully run through approximately 18,000 ft. of 14" field line. It required a pressure of about 100 lbs. per square inch to start the scraper as the cutter blades were quite heavy and exerted considerable pressure against the interior of the pipe. The exact speed of the scraper was not measured, but observers stationed at the outlet end of the pipe stated that the scraper emerged at a quite moderate speed, estimated to be about 20 miles per hour. However, it was apparent that the pressure required to start the scraper was greatly in excess of that required to keep it moving after it had once started, and also that after travelling only a very short distance through the pipe the tips of the blades became sufficiently worn to materially reduce their pressure against the interior of the pipe and consequently reduce the friction to be overcome. The pipe through which this scraper was run was substantially clean before the scraper was put in it and the only material removed was finely powdered scale scraped from the pipe.

The scraper was introduced into the pipe by removing one 20 ft. joint and jacking the scraper into the pipe through a funnel made up of a short length of 22" pipe turned out inside to as large an internal diameter as possible at the entrance end. At the point where the scraper was to emerge from the line, two joints of pipe were removed and in order to prevent damage to the scraper and to the open end of the pipe beyond, a backstop or buffer was constructed, which consisted of several bales of hay stood on end in the ditch and held in place by earth packed between them and the sides of the ditch and filled in between them.

Twenty-two Inch Scraper

A 22" scraper was next constructed which incorporated improvements based upon the experience gained in the operation of the two smaller models. The core of this 22" scraper consisted of a front spindle of 8⅝" outside diameter pipe carrying the cutter blades and separating washers, followed by a length of 14" pipe to give the necessary length to the device and to carry the rubber squeegee discs. This 14" pipe scraper body was cut away in a lattice pattern to reduce its weight and to allow the passage of gas through it. The cutter blades, which were manufactured by one of the saw companies, were of tempered spring steel, each having 30 teeth. Four of these blades properly staggered would completely cover the inside of the pipe. Eight blades were used on the scraper, the front four blades being of 12 gauge steel to provide the necessary stiffness to remove firmly attached scale and encrustations. These blades were only slightly larger in diameter than the inside diameter of the pipe. The four blades in the rear were of 16 gauge steel, about ½" larger in diameter than the inside diameter of the pipe so that they would trail about 1¼" and would give the inrior of the pipe a second scraping but not with as much pressure as that given by the front four blades, and it was hoped that as they wore off these eight blades would straighten out and maintain effective scraping pressure on the inside of the pipe. It was intended to tip the blades with stellite if they were found to wear excessively.

The orifice controlling the flow of gas past the scraper was a peripheral orifice around a baffle plate instead of a circular orifice through the core, it being intended that the size of the orifice would be adjusted by increasing or decreasing the diameter of the baffle plate. The scraper had an ordinary steam whistle in it to assist in observing its passage through the line and to assist in locating it if it should hang up at any point. It was found, however, in trial runs that this whistle was not necessary as the gas flowing around the scraper made sufficient noise to permit easy location of the device. The completed 22″ scraper weighed 392 lbs.

This 22″ scraper was given its initial trial by being run through one mile of 22″ field line. It started when the pressure at a gate box about two miles away had been built up to 30 lbs. per square inch. A pressure gauge was installed in the line pipe a few hundred feet ahead of the point where the scraper was inserted and when the scraper passed this point, this gauge indicated a pressure of 18½ lbs. per square inch, which was sufficient to keep the scraper moving. The scraper travelled in this first test at an extremely high velocity, from 120 to 300 miles per hour. It was not stopped by the backfilling of alternating bales of hay and loose earth, which had been placed in the ditch but which had not been properly formed with a vertical face, and after hitting the sloping front face of the backfill bounced into the air and hurtled over a hill, hitting the ground for the first time 600′ from the outlet and finally came to rest 700′ from the outlet. This experience is mentioned to stress the importance of a properly constructed backstop with a vertical face and as a warning of the danger to life and property which may exist in connection with experiments with a scraper propelled by a compressible medium such as natural gas.

The high velocity in the initial test was brought about by a combination of two factors, first, the rather high pressure built up in order to start the scraper, and, second, the reduction in friction due to the wear of the blades. When the scraper was introduced into the line, it required heavy pressure with a jack to move it, and after it had emerged the diameter of the blades had been reduced by wear to approximately 1″ less than the interior diameter of the pipe, and in this worn condition the scraper could be pushed through the pipe by hand.

In the second trial of the scraper, a new set of blades was installed and the baffle plate was removed, so as to provide for the passage of a greater quantity of gas through and around the device. In this second test, the pressure was brought up very slowly and the scraper was run through two miles of pipe.

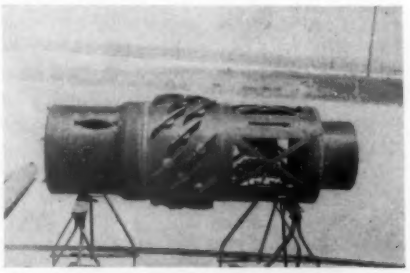


Fig. 2. Improved 22 inch Scraper.

The blades used in the second test were used again in a third test and because of the amount of wear, which made it possible to push the scraper into the pipe line by hand, it started to move at a pressure of only ⅞ of a pound per square inch. An effort was made to run the scraper as slowly as possible during this test, and after the scraper started to move the flow of gas into the line was maintained at a steady slow rate. It was found that the scraper travelled

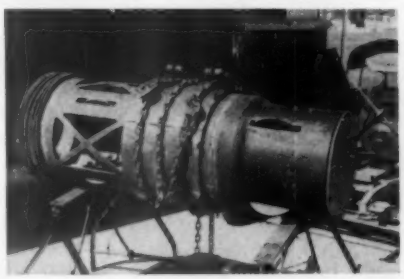


Fig. 3. 22 inch Scraper with blade retaining band in place.

under a pressure of approximately ½ pound per square inch, but occasionally encountered additional resistance due possibly to lack of uniformity in the character of the pipe surface over which it travelled and in part to the small hills over which the pipe line passed. Occasionally the pressure built up to ¾ or ⅞ of a pound per square inch for a short time and then dropped back to ½ pound per square inch. It required 52 minutes and 10 seconds for the scraper to travel the two miles of line in this test, or in other words, it travelled at a speed of only 2.3 miles per hour. During this test the blades were reduced in diameter an additional 1/32″ by wear.

Final Design of 22″ Scraper

Based upon the information and experience secured in the tests of the 8″, 14″ and 22″ experimental scrapers an improved 22″ scraper was constructed which was used in the actual operation of cleaning the interior of the principal transmission line of the gas company. In the design of this new scraper a radical departure was made from the previous designs. The experiments thus far had indicated uniform pressure of the scraper blades against the interior of the pipe and a consequent fairly uniform frictional resistance to be important factors in controlling the speed of a scraper in a gas line since under these conditions the principal factors causing variations in the speed of the device are the rate at which gas is admitted to the line behind it, variations in resistance due to varying conditions of the interior of the pipe and variations due to grades in the pipe line. Accordingly, the new scraper was so designed that even after a very considerable amount of wear the blades would be maintained in contact with the interior of the line pipe under definitely controllable and constant pressure exerted by coil springs.

In the new scraper the blades were placed at an angle of 45° to the longitudinal axis of the device and were of such length that their projected length along the axis of the scraper was sufficient to bridge any gap or opening between pipe ends in a Dresser coupling. Three rows of blades were provided, overlapping sufficiently to provide two complete scrapings of the interior of the pipe. The blades themselves were of tool steel, ¼″ thick, edged with stellite.

The pressure of the blade springs would not necessarily be sufficient to support the weight of the entire device, and supporting wheels were accordingly provided at the front and rear ends of the scraper. These wheels were carried on spring mountings so that the device could pass through egged or buckled pipe, the springs being sufficiently heavy to carry the entire weight of the device on one front and one rear wheel and the flexible wheel supports were so arranged that the wheels could not be pushed entirely inside of the scraper, which would allow the scraper to slide along the pipe instead of rolling on the wheels.

The body of the scraper was composed of a piece of 20″ outside dia-

meter pipe and a 20″ by 18″ swedge welded together, the purpose of the swedge being to reduce the diameter of the front of the scraper so as to

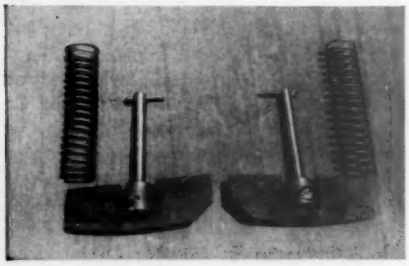


Fig. 4. Detail of scraper blades, blade stems and blade springs.

provide sufficient clearance to permit the scraper to pass around bends in the pipe or breaks at the couplings. The body of the scraper was cut away to reduce the weight of the device which, when completed weighed approximately 800 lbs.

Figure 2 is a photograph of the device, complete except for the rubber squeegee discs which had not been bolted on the spindle at the rear end at the time the photograph was taken. Figure 3 is a photograph of the complete device including a sheet iron jacket around the blades, used to hold them close to the body of the scraper to facilitate inserting the scraper in the pipe line. Figure 4 is a detail of the scraper blades, blade stems and blade springs while Figure 5 is a detail of the middle portion of the scraper showing the blades in position. Figure 6 is a photograph showing the scraper being inserted in a joint of 22″ line pipe and indicates the position which the blades assume in the line pipe. The pressure of the blades against the interior of the pipe was about 50 lbs.

Before using the new scraper in the main transmission line, trial runs were made with it in a 22″ field line for the purpose of revealing any mechanical defects in its construction and to determine accurately the pressure required to start it and to keep it in motion, as well as the amount of gass passing through and around the device at various pressures. In the first trial run through two miles of field line it was found that the scraper started at a pressure of 8.77 lbs. per square inch and travelled the two miles at an average rate of speed of 55 miles per hour. After the scraper started, the pressure dropped gradually from 8.77 lbs. per square inch to 5.83 lbs. per square inch, the control valve admitting gas behind it being left at its original setting.

Having determined the necessary data as to the pressures required to start the scraper and to keep it moving, a control valve and metering run assembly was constructed consisting of a 22″ bull plug at either end of a short length of 8″ line pipe in which were installed an 8″ gate valve for controlling the flow of gas and a pair of orifice flanges for measuring the volume passed. In subsequent runs of the scraper this metering run was coupled into the pipe lie in place of the joint of line pipe which had been removed in order to insert the scraper. In using this con-

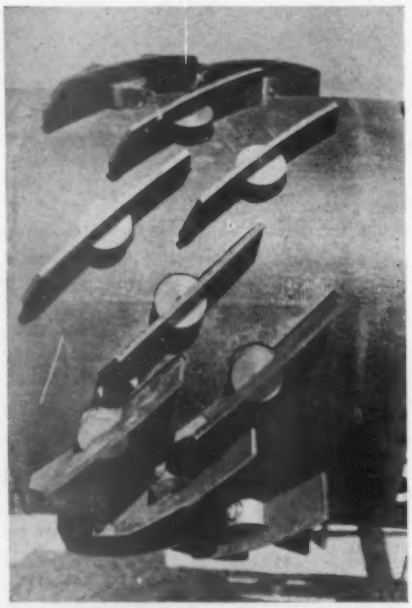


Fig. 5. Detail of middle portion of scraper showing blades in position.

trol assembly the plan of operation was to maintain from 40 to 60 lbs. per square inch pressure on the orifice meter by admitting gas to the line at an upstream block gate. By pinching the 8″ control valve immediately downstream from the meter in the assembly this valve would be under critical flow because of the relatively low downstream pressure, and pressure changes downstream would not materially affect the delivery rate.

In the second trial run of the scraper in the field line, measurements were taken of the amount of gas passing through and around the scraper at various pressures when the scraper started the amount of gas admitted to the line, in addition to that passing through and around the scraper, was increased by an amount calculated to pack the line behind the scraper at a rate which would provide for the displacement volume created by the travel of the scraper at a predetermined velocity. It was found that the starting pressure varied from approximately 4 lbs. to approximately 6 lbs. per square inch, depending presumably upon the condition of the interior of the pipe at various points. The pressure required to maintain the scraper in motion after it once started, was approximately 3 lbs. per square inch, at which pressure gas passed through and around the device at the rate of approximately 10,000 M cu. ft. per 24 hours.

A third two-mile test run was made in which the scraper started to move at a pressure of 5.9″ of mercury (approximately 3 lbs. per square inch) at which time gas was being admitted behind it at the rate of 10,300 M cu. ft. per 24 hours. An endeavor was made to immediately increase this rate of flow by an amount which would pack the volume of line displaced by the travel of the scraper moving at an assumed speed of 10 miles per hour at the pressure at which the scraper started. The scraper travelled the two miles of line without stopping and emerged in 8 minutes and 20 seconds from the time it started, travelling at an average speed of 14.4 miles per hour. Its emergent speed, measured over the last ½ mile of travel, was approximately 22 miles per hour. It was found in all trial runs of the scraper and in its actual use in cleaning the main line that whenever the emergent speed was measured, it was somewhat higher than the average speed of travel.

Use of the Scraper in the Main Line

The field line trial runs of the scraper indicated that this device could be counted upon to safely and successfully clean the interior of the 22″ main line and that the velocity

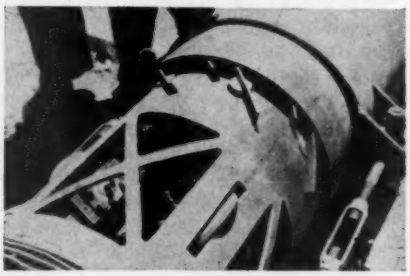


Fig. 6. Scraper being inserted in a joint of 22 inch line pipe.

of the device could be controlled within reasonable limits by controlling the inlet volume of gas behind it.

(Continued on page 76)

Developments in Uniform Classification of Accounts*

By H. C. Hasbrouck

H. C. Hopson & Co.

IN discussing "Developments in Uniform Classification of Accounts," I shall confine myself, first, to a rapid review of what I conceive to be the recent tendency of accounting regulation by governmental authority; second, a statement of the immediate problems that confront the industry in this connection; and third, the expression of some views of my own with which not all of you will, perhaps, agree, on principles of uniform accounting and governmental regulation of accounting practices.

So far as I am aware, the first attempts to establish by regulatory authority uniform accounting standards for the gas industry were made by the Massachusetts Board of Gas Commissioners in 1886. It is interesting to note from the Second Annual Report of the Massachusetts Board of Gas Commissioners dated January 1887 that complaints against the system of bookkeeping prescribed by the Board "were usually on the ground of the labor involved or expense incurred for such labor." It further appears from the same report that many of the objections were to the double entry, accrual system prescribed by the Board to supersede the simple record of cash receipts and disbursements which is all that the objecting companies had been in the habit of keeping. These objections the Board found "not reasonable." However, the report notes:

"From the large companies, which usually employ skilled accountants, there has been but little complaint; and notwithstanding the fact that accountants are, as a rule, not inclined to indorse new forms, that class of companies was the first to adopt any changes required to make their accounts conform to the plan prescribed."

The "General Instructions regarding the Form for the Books and Accounts to be kept by Gas Companies," which appear as Appendix B to the Boards Second Annual Report, are interesting but time will not permit dealing with them at length. There were twenty-three expense accounts. The text for the ledger account entitled "Cost of Works" reads as follows:

Cost of Works

"This account should show, either in detail or in one 'Construction Account' (as may have been the custom of the Company), the cost of the Company's works, including street mains, meters and holders, as they stood on its books on the 30th day of June, 1886. Any company which has not heretofore kept such an account should open it now with the present estimated value (in detail, if possible) of its works. Important additions to works and extensions of mains should be charged to this account. Any contributions towards the cost of such extensions to be credited to this account."

In June, 1887, the legislature gave the Board of Gas Commissioners jurisdiction over electric light companies and constituted it a Board of Gas and Electric Light Commissioners. The Board promptly issued "General Instructions regarding the Form for the Books and Accounts to be kept by Electric Light Companies," which appear as Appendix D of the Board's Third Annual Report.

Massachusetts seems to have maintained its lonely eminence in the regulation of accounting by gas and electric utilities until about 1907 or 1908, when governmental regulation of public utilities began to be pretty generally established. The powers of the Interstate Commerce Commission were increased and it issued its first classifications of accounts for steam railroads. Public service commissions with very broad powers were set up in Wisconsin and New York and most of the other states quickly followed their example. Among the first acts of the Wisconson and New York commissions thus established were the promulgation of uniform systems of accounts.

To a considerable extent the laws establishing the other state regulatory commissions were patterned on the New York and Wisconsin laws, and most of the newly created state commissions adopted accounting classifications following the general outline of those promulgated by the New York and Wisconsin commissions. The emphasis in these early classifications was for obtaining information in the most usable form and not upon restricting the power of the industry to conduct its own business in its own way as long as it continued to perform its essential function of giving good service at a fair price.

There were enough differences in the accounting classifications prescribed by various states to be annoying and costly as the light and power industry grew and developed into larger economic units for which state boundaries were artificial divisions. Efforts of the electric and gas accountants for a national uniform standard came to a head in a resolution adopted by the National Association of Railroad and Utilities Commissioners at its annual convention in Indianapolis in 1919, placing upon its standing Committee on Statistics and Accounts of Public Utilities the duty of formulating and presenting to the Association uniform accounting systems for utilities other than railroads. The work of this Committee, which was accomplished in close cooperation with the accountants of the industry, culminated in the Uniform Classifications of Accounts for Electric and Gas Utilities which were presented to the National Association of Railroad and Utilities Commissioners and approved by it at its annual convention in 1920. With some revisions approved by the Association in 1922, these classifications were adopted by most of the state commissions and still remain effective in a majority of the states. They were quite generally adopted as standards by the light

* *Presented at Accounting Section, A. G. A., October 27, 1936.*

and power industry and have, on the whole, served their purpose well.

It is difficult to say just when the idea of uniform accounting as an efficient instrument for obtaining information began to be supplemented, and perhaps by now we may say superseded in many quarters, by the notion that a classification of accounts should be framed so as to control rigidly the underlying financial and operating policies of public utility management. The tendency toward this idea, however, is the characteristic development in the field of public utility accounting today. A paper entitled, "Regulation by Accounting—An Innovation" by Park Chamberlain, an attorney at the time representing the United Light and Power Company, presented before the Illinois Public Utilities Association on April 5, 1935, contains some well expressed descriptions of this tendency. Mr. Chamberlain's paper had reference particularly to a classification then recently issued by the Wisconsin Commission, but the statements which I quote below from that paper have a general application to certain tendencies of state and Federal regulation today with which we are all painfully familiar.

Regulation by Accounting

"Accounting, in its modern concept, is the art of accurately recording the financial transactions of a business enterprise and correctly portraying its investment in property, its equities and its income. It is essentially factual. It is a friend, not a foe, to business.

"Consequently, when a new system of accounts is proposed, which adds refinements to a former satisfactory system, the manager is apt to shrug his shoulders and dismiss it from his thought as one more unnecessary expensive annoyance to be put up with, but nothing more serious. He little dreams that there may be concealed within the system provisions which defeat the very purpose of accounting; which prevent a reflection of the true income, as well as of the actual investment in property; which deprive the owner of his property, his constitutional rights, and almost the last vestige of his managerial power.

"Every decade brings on its horde of reformers and this one has been no exception . . . They have originated radical measures by the score and have succeeded in getting them before the legislatures of their states. . . . Tempered with intelligent business judgment, their own bills came out quite unrecognizable and ineffective for their radical purposes. In their eagerness to rule, all laws became to them inflexible and futile. . . .

"Tired and disgruntled from their failure to obtain effective legislation, and spurred on by zeal, as well as defeat, these men are seeking to read into uniform accounting statutes the power to regulate through requirements in respect to the method of carrying accounts."

New Phase

A new phase in the development of uniform accounting standards for the gas industry may be said to have begun in September 1935, with the receipt at A.G.A. headquarters of a report by the Committee on Statistics and Accounts of Public Utilities of the National Association of Railroad and Utilities Commissioners recommending a radically revised uniform system of accounts for electric utilities. In its report the Committee stated:

"It was not found possible within the time allotted to the Committee to prepare a revision of the System of Accounts for Gas Companies. It should be stated, however, that the Balanced Sheet, Income and Surplus Accounts in the revised system for Electric Companies proposed by the Committee would be the same in any revision of the System for Gas Companies."

The history of the discussions, correspondence, reports, hearings, and briefs dealing with subsequent attempts to establish a national uniform classification of accounts for electric and gas utilities is reasonably familiar to all of you and need not be recounted here. The important new element in the problem during this period has been the insistence of regulatory bodies, particularly Federal regulatory bodies, on rules designated as "Uniform Systems of Accounts" which go far beyond the formulation of uniform methods of accounting. These uniform systems of accounts if strictly interpreted and enforced would reduce the responsibilities of utility managers to little more than those of government clerks.

At present the situation with which the gas industry is confronted may be thus stated. The Accounting Committee of the National Association of Railroad and Utilities Commissioners and the accounts of the Federal Power Commission have together worked out two uniform systems of accounts for electric utilities which are for all practical purposes identical. The Federal Power Commission has prescribed by order its system for electric utilities which come under its jurisdiction, to be effective January 1, 1937. The Accounting Committee of the National Association of Railroad and Utilities Commissioners will recommend to the annual convention of that Association which meets here next month, the approval by the Association and the adoption by member state commissions of not only what is virtually the Federal Power Commission's Uniform System of Accounts for Electric Utilities, but also of a Uniform System of Accounts for Gas Utilities similar in all important principles, including the grotesque requirements as to accounting for "original cost." The state commissions, traditionally inclined to be rather suspicious and resentful of Federal encroachment on their jurisdiction, are not too favorably disposed to the radical departures from hitherto generally accepted accounting principles embodied in the Federal Power Commission's uniform system of accounts and in their own Committee's recommendations. However, they are faced with the apparent certainty that the Federal Power Commission will attempt next January 1 to enforce its accounting system on many electric utilities engaged in Interstate Commerce, and the state commissions hesitate to force the issue by insisting on accounting requirements for such companies also subject to state regulation, which would be in conflict with the requirements of the Federal Power Commission. What the result will be, the Atlantic City meeting of the National Association of Railroad and Utilities Commissioners will show. I venture the opinion, however, that if the Federal Power Commission's uniform system of accounts were not to be effective January 1, if its effective date were to be postponed by reason, for example, of court action such as that which most of the telephone companies have united to bring against the Federal Communication Commission's new Uniform System of Accounts for Telephone Companies which embodies certain principles generally similar to the objectionable features of the Federal Power Commission classification, the National Association of Railroad and Utilities Commissioners would not readily ap-

prove the more radical recommendations of its Accounting Committee, but would delay final action until the far-reaching consequences thereof could more clearly be understood.

Consequences

What some of these consequences may be and the possibilities therein for long, difficult, and costly litigation is evident from the experience of the utilities in New York State. There, last May, the Court of Appeals, the State's court of last resort, overturned orders of the New York Public Service Commission attempting to prescribe an accounting treatment of property values which the Court found to be arbitrary, illegal and unconstitutional. The Court specifically condemns the requirement of the orders that permanent property values in books of account and public statements should be determined primarily by the "original cost" of such permanent property rather than by its cost or value to the accounting company. The Court also condemned as confiscatory the requirement that loss in the value of permanent property must be recognized in the accounts as determined by the "straight-line" theory. The industry as a whole is facing today the same sort of battle that the New York State utilities have faced. In New York the fight lasted three years and so far the result appears to have been favorable to most of the contentions of the utilities. However, it is rumored that the Commission accountants are at work on revised accounting orders to meet the law as established by the Court of Appeals decision and it is at least conceivable that these new orders will only start a fresh battle.

Conclusions

In half a life time I have reached certain conclusions with respect to the problems of public utility accounting, particularly uniform accounting codes.

In the first place, uniformity is highly desirable to the extent, and no further, that it means using the same terms for the same things, and describing the same things by only one set of terms. Uniformity of practice, in other words, is largely a matter of uniformity of language. The same set of words should always describe the same acts or transactions. We all in theory, of course, agree that such uniformity is good, but in practice we are too likely to be so convinced that our accustomed way of setting up accounts and statements is the best, if not the only, way to set them up, that we hate to accept anything that would change our association of words and action and agree only on vague general phrases which cover so much ground that they are in large measure meaningless.

No uniform classification which is the result of the collaboration of a number of accountants will ever be wholly satisfactory to any one of them. Accountants are noted for expressing vigorous individual and often conflicting views respecting the practice of their art, a fact commented on in the opinion of the New York Public Service Commission issued June 26, 1934, In the Matter of an Investigation by the Commission into a Uniform System of Accounts for Telephone Corporations (5 PUR N.S. 402). The opinion says:

"The criticisms and suggestions made by Mr. Bradshaw" (Chief Accountant of the New York Telephone Company) "were endorsed practically to the dotting of an 'i' or the crossing of a 't' by the other companies represented at the hearing, a fact which strikes us as somewhat peculiar in view of the well known tendencies of expert accountants to differ upon minor points if not upon major ones."

Round Table Conferences

All uniform classifications are, of course, compromises. I do not mean to suggest that things essentially different should be forced into a uniform pattern which they do not fit, but I should like to drive home the point that the goal of simplicity and uniformity, and hence understandibility, is important enough to be worth a lot of sacrifices of pet practices.

A common sense, practical criterion of selection among different accounting practices and their descriptive terminology is to choose as a universal standard that which carries the clearest idea to the most people. The most effective way of applying this criterion is the method of a round table conference with a carefully selected representative group, though such a conference must be admitted by all who have taken part in one to be a tedious and nerve-racking experience. It is one of the principal weaknesses of the classifications now proposed for adoption as national standards by the Federal Power Commission and the Accounting Committee of the National Association of Railroad and Utilities Commissioners that they were not worked out by any such representative group but were first developed by accountants whose principal, and in many cases whose sole, experience had been with governmental bodies and who had no adequate conception of the practical problems that have to be met by the operating public utility accountant. True, the accountants of the industry were allowed to state their criticisms and suggestions to accountants of the Federal Power Commission and the Accounting Committee of the National Association. But this is a very different thing from meeting in joint committee day after day for perhaps several weeks in the aggregate and thrashing out together the innumerable questions of method and of language which arise in any attempt to standardize and codify so intricate and vital a procedure as public utility accounting practice.

New Hampshire Classifications

The New Hampshire Public Service Commission deserves credit for seeing more clearly and following more closely than any other regulatory authority in recent years the principles just stated, and its Uniform Classification of Accounts for Electric Utilities, adopted just before the present attempts to establish new national uniform standards got under headway, might, to the great advantage of all concerned, have served as the basis for a national standard code,—not that utility accountants as a group can unqualifiedly accept all the provisions of even the New Hampshire classification. It is illuminating to note, however, that in its report dated June 30, 1935, of a rehearing requested by some of the New Hampshire companies on certain phases of the Commission's order prescribing a Uniform Classification of Accounts for Electric Utilities effective January 1, 1935, the New Hampshire Commission did expressly recognize that widely accepted usage should not be departed from for the sake of a theory, however logical, unless there should be a very definite advantage for clarity and exactitude for so doing. In the report referred to the Commission said:

"If the method of accounting pro-

vided for in our Uniform Classification, were followed for New Hampshire operations, the result would be confusing, particularly to investors, since it would invalidate direct comparisons of Net Electric Operating Income between companies doing business in New Hampshire and those operating in other states.

"This is an objection which, while not controlling, is entitled to serious consideration, since comparisons of Net Electric Operating Income from company to company constitute a very significant index to the financial results of operations and to the relative prosperity of utilities. In our opinion, therefore, the Classification may properly be amended to remove the objection, provided this may be accomplished without impairing the usefulness of the data thereby made available to this Commission for regulatory purposes."

Codes

In discussions of accounting codes established by governmental authority much has been made of the distinction between regulation of accounting and regulation of management. I venture the more or less heretical assertion that there is no clear-cut logical line of demarcation. Accounting is a function of management and an important function. Any restrictions on accounting practice, any degree of regulation thereof, is a limitation on the freedom of management. It is equally true that traffic control is a limitation on the freedom of the motorist to go when and where he pleases; but we all recognize that though the individual motorist may sometimes be irked by an inopportune red light, traffic as a whole will go farther and faster because of its regulation. Any uniform standard of accounting usage implies certain restrictions on the management upon which such standards are imposed. But there is a great difference between stationing a traffic officer at dangerous intersections and planting a back seat driver in every car—at the taxpayer's expense. It is against the interest ot customers, investors, and managers—indeed, of everyone except a handful of petty bureaucrats—to hamper in any way the free exercise of managerial discretion except where it can be shown beyond a shadow of a doubt to any reasonable and well informed person that a proposed restriction actually would do away with a misleading form of statement or an unfair practice.

So far, I believe this paper has established a record for discussions of uniform accounting classifications in that up to this point the word "depreciation" has not yet once appeared. What I have to say about depreciation, however, is merely a brief analysis of the effect, as I see it, of the accounting for depreciation which is required in the proposed codes of the Federal Power Commission and the Accounting Committee of the National Association of Railroad and Utilities Commissioners. These codes, influenced perhaps by recent court decisions, do not specifically mention "straight line" depreciation nor definitely require that the recognition of lost service value must be spread evenly over the average service life of each class of property. The "service value" which is to be accounted for according to the proposed classifications is, by definition, nothing more nor less than the "retirement loss" of the 1922 NARUC classification. But there is a vital difference between the charge representing the amount of depreciation "accrued" for any month, to be recorded in accordance with General Instruction 10 of the Federal Power Commission and General Instruction 9 of the NARUC Accounting Committee electric codes, and the amount of "retirement expense" which the 1922 NARUC classification would require. The distinction between the older and newer codes is that the latter conceives of the "accrual" for depreciation expense as a recognition of an actual loss realized when it is recorded on the books of account; while the former starts with the assumption that the loss is not realized until the actual retirement and that the amount recorded currently as retirement expense is an anticipation of future loss and not an actual current loss.

Depreciation

Strictly and literally interpreted the language of the F.P.C. new Uniform System of Accounts on depreciation accounting, as well as that proposed by the Committee on Statistics and Accounts of Public Utilities of the National Association of Railroad and Utilities Commissioners seems to me to be the equivalent of saying to the accounting utility:

"You may take as depreciation in any given period whatever you are willing to admit as a loss in 'service value' of your property during that period. You may determine this loss in any way you choose. We, of course, reserve the right to say whether the result arrived at is reasonable, just as we reserve the same right as to any other item claimed as an operating cost, in case the question becomes an issue in a rate or other proceeding. Until such an issue arises, you are the judge at your own risk of the amount of lost service value to be accounted for in any accounting period."

If my interpretation is correct, an accounting company acting under the F.P.C. System of Accounts would be free to charge the depreciation expense accounts with any amounts which it was willing to admit represented value actually lost during the accounting period, and then to provide a reserve against the much greater loss which it could reasonably expect to be realized upon future retirements caused by obsolescence or inadequacy. However, it is fairly certain that the accural for such a reserve would not be accepted by the Federal Power Commission under its new code as a legitimate cost of operation.

Original Cost

In conclusion, just a word about "original cost." There is, I believe, a practically unanimous opinion not only among the accountants of the industry, but among all professional accountants, outside of a little group of accountants attached to regulatory governmental bodies, that the "original cost" provisions of the new accounting codes recently issued or proposed by the Federal Power Commission, the Accounting Committee of the National Association of Railroad and Utilities Commissioners, and the Federal Communications Commission, as well as by the latest Wisconsin classification of accounts and the New York classification which was upset by the Court of Appeals, place an absurd emphasis on the importance of "original cost" as a factor in determining value. The only justification which has ever been attempted for this curious lack of balance, is, so far as I recall, the argument that transfers of public utility properties are always at inflated values, which is pure assumption and the argument that certain Supreme Court decisions have referred to "original cost" as a factor to be given consideration in determining "fair value." The first argument I do not propose to discuss. In any case, it is scarcely

(Continued on page 82)

House Heating Progress During 1936

E. H. Lewis, Vice President

The St. Louis County Gas Company
Webster Groves, Missouri

THE remarks which I have to make concerning house heating progress during 1936 relate only to the progress made by the Company which I represent. I realize that different companies have widely diversified sales plans designed to meet conditions peculiar to the territories they serve. Some have operated on the campaign basis with frequent changes from year to year, while others have followed along one general pattern with only slight changes to meet changing conditions.

The St. Louis County Gas Company falls in the latter classification, and such progress as has been made during 1936 could be briefly summed up as simply an extension of activities carried on prior to that date. However, before proceeding further, it may be well for me to give you a little of the background of our picture.

The St. Louis County Gas Company serves 43,900 customers, of which 42,200 are domestic. All of these are in suburban territory in St. Louis County, Missouri, which is largely residential in character and adjacent to the corporate limits of the City of St. Louis. Since 1932 we have supplied our customers with an 800 Btu. mixture of natural and manufactured gas. Prior thereto we distributed 570 Btu. carburetted water gas. In our locality a normal winter contains 45 25 degree days.

The present house heating rate includes an initial block at $1.05 per thousand cubic feet and the size of this block increases as building volume increases. The second, third and fourth steps of the rate are at 60c, 50c and 46c, respectively. These are gross rates and a small discount applies for prompt payment. Domestic usage is supplied through the same meter as the heating gas and all is billed at this rate. For a normally heated residence the average net rate for heating gas, after deducting domestic gas at the general rate, will run close to 60c per thousand cubic feet or 7½c per therm.

House heating customers, including some under contract but not connected as of October 1, total 3,301. When the customers now under contract are connected, house heating saturation will be in excess of 7½% of total customers. In the year 1935, 38% of our total sales of gas were to house heating customers. We estimate that for 1936 this figure will be increased to 45%.

The effect of heating sales on our revenue per customer is very pronounced. In 1935 our average revenue per residence customer without a heating plant was $29.00, from residence customers with heating plants $229.00, and from both combined was $39.00. This was accomplished with a heating customer saturation of less than 5%.

Rates

The heating rate which has already been outlined briefly is a form of rate which has been used for house heating since 1919. During these years the size of the blocks and the charge per thousand cubic feet have been changed from time to time, but the fundamental rate form has remained unchanged and we feel that the rate has helped greatly in securing varying sizes and types of buildings at equitable average rates for the service. You will observe that the rate includes what some might call a radiation charge, although in this case it is based on the volume of the house. A customer with a poor load factor automatically pays a higher rate than the customer with a good load factor. This form of rate provides desirable customers with lower cost gas than rates which give no consideration to load factor.

Sales Force

For more than ten years we have had a house heating force organized for the sole purpose of selling house heating. This force has been expanded from time to time and at no time since its organization have its activities been curtailed. The entire program of selling house heating is organized on the basis that every installation must be properly sold before it is placed in service. Careful estimates are made for every prospect by an engineering department which cooperates closely with the sales department, but which is not under sales department direction. This is done even in cases where, prior to the preparation of the estimate, the prospect has decided to, or has actually installed gas heating equipment. Salesmen are trained to present their sales story before quoting cost figures, but must, before a sale is closed, see that the customer understands the cost quotation. Every quotation is confirmed by a letter from the Company, but salesmen direct when these confirmations are to be mailed.

At the present time the sales force is divided into two groups of salesmen, four to work with builders, architects and new house prospects, and six to convert the users of other fuels to gas. Salesmen are paid a salary plus a commission for the load secured plus a commission for conversion burners they sell. The Company has never in its history sold gas designed heating equipment. Where such equipment is sold for installation in old houses, the salesmen receive a bonus which exceeds any commission they might earn by selling a conversion burner. For new houses gas designed equipment is used in practically all cases and no commission is paid salesmen for conversion burners sold for use in new houses, although commission is paid for the load secured.

Sales Plan

No doubt there are many opinions held among gas men concerning the merits of the trial installation and the rental sales plans. Our opinion, based on studies made of these plans when used by others and on our own experience, is that both have very little, if any, permanent value as applied to house heating. I will go further and say that we feel that the adoption of either would be very detrimental to our progress. To the customer who is now heating with some other fuel and is considering a change to gas, there is only one possible objection he can have to gas heat—that is the fear that the cost may be excessive. As I have already explained, we prepare careful esti-

Delivered before Eighteenth Annual Convention, American Gas Association, Atlantic City, N. J., October 26-30, 1936.

mates for all prospects. After preparing these estimates we are in a position to install a burner for a customer and to guarantee that if the actual heating cost during the first heating season exceeds our estimate by 10% or more we will remove the equipment and refund all money paid on it. In these cases the customer does not have a trial installation and does not have one on which he pays rental. If our estimate is accurate, the sale is not subject to cancellation. If the cost exceeds our estimate by 10% or more during the first season, the customer is privileged to have it removed and is not out the amount that would have been paid under a rental plan. During the first nine months of 1936 we did not remove a single conversion burner because of the terms of this guarantee. In our advertising we refer to this as our ONE YEAR PLAN, adopting the Russian mode.

Advertising

Because of conditions peculiar to our territory, which is suburban in character, newspaper advertising is very expensive per unit of customer circulation. Nevertheless, we have done considerable newspaper advertising and we wish that our cost per unit of circulation were such that we could afford to do more. We feel that the results we have obtained from newspaper advertising have been of exceptional value to our program.

We have used a great deal of direct-mail. In fact, in 1932 and in succeeding years following the introduction of 800 Btu. gas and a reduction of one-third in our rates for heating service, we used so much direct-mail advertising that, to a considerable extent, it lost its value for us. At the present time we mail from four to six direct-mail advertisements to approximately fifteen thousand of our customers each year.

Competition

In the territory which we serve good bituminous coal sells for from five to seven dollars per ton and No. 3 oil for about 6½¢ per gallon. We do not consider coal, used either with or without a stoker, as offering a service which is competitive with gas. Oil does furnish a somewhat similar service but on the basis of total operating cost, including investment, depreciation, maintenance, etc., we have no difficulty in showing customers that we have the advantage with oil at any price close to six cents. This cost advantage, however, is not fully present where the customer has usable oil burning equipment. In such cases we have endeavored to present our story in such a way that, when trouble does develop on the oil burning equipment, customers will realize that it is then time to change to gas. Of course, some customers change before their oil burning equipment breaks down completely, but our sales program is laid out with the intention of presenting facts to oil burner users before they have trouble, so that when the trouble develops they will have already reached a decision and order gas heating equipment installed. This plan has the additional advantage of placing us in a position to make the installation of a gas burner quickly, sometimes in a matter of a few hours after the customer phones us his order. In such cases quick action is required, as you can bet the oil burner service man is on hand to take the customer's order for a new oil burner for immediate installation. This program of replacing oil burners has proved successful and we plan to increase our activities in this direction.

Dealer Relations

Contractors and gas equipment sales organizations should form an important link in any sales program. I shall simply outline a few policies as we have applied them.

1. Dealers and contractors sell and install all gas designed equipment that is sold. Gas Company salesmen receive load commissions and a bonus on such installations.
2. Gas Company equipment sales are restricted to conversion burners, space and unit heaters and salesmen are paid a commission on these only if they file the prospects at the office before a dealer does.
3. Allowances are made for oil burners. Dealers make the same allowance for such equipment and are reimbursed by the Gas Company.
4. Dealer's time payment paper is handled on the same basis as Gas Company sales, and dealers may make the same guarantee as provided under the ONE YEAR PLAN previously referred to when based on Company's estimated cost of operation.
5. The full resources of the estimating department are available to cooperating organizations.
6. Advertising has featured the advantages and general acceptance of gas for heating. Specific types of burners and equipment, prices, etc., are not referred to in Gas Company advertisements.
7. Cooperation is extended to organizations selling related products and to organizations with direct mail programs which can be used on a cooperative basis.

Customer Contacts

No outline of house heating progress would be complete without stating that progress must not cease when a heating customer is secured and the installation completed. Heating customers should be completely informed concerning various matters relating to the heating of their homes. We usually contact our heating customers once or twice a year with some form of direct-mail material, usually of a service type. Customers are given information concerning the Degree Day as the unit for measuring fuel requirements and every gas bill that is mailed out has stamped on it the number of Degree Days in the period covered by the bill.

A tabulation showing degree days for preceding years by months and for a normal year is reguluarly carried on the bills during the heating season.

A consistent program carried on over a period of years of educating customers to the use of this degree day data in comparing bills for one month with another has gone a long way toward eliminating high bill complaints and has made it easier to handle such complaints as have arisen. It is not unusual to hear the users of gas in our territory discussing, in their social and business contacts, degree day data and its effect on their consumption of fuel. I recommend some such plan to you if you do not already have one in effect.

The direct-mail material which we have sent to customers has offered definite service information or suggestions and the indications are that our customers are to a very large extent responsible for the spreading feeling in our territory that modern heating equipment must be gas fired.

Servicing Customer Installations

While servicing customer installations is not directly a selling function, nevertheless, it is an important part of any program to promote the use of gas for heating. We believe it is our duty, as well as good business for us, to carefully check up and test out every new gas heating installation put on our lines, whether the equipment is sold by our Company or others, before that installation is placed in service, to see that it is placed in operation in a satisfactory manner for the first time, and for thirty days follow up its operation

(Continued on page 86)

Accounting Session

1936–1937

Chairman—Herbert E. Cliff, Public Service Electric & Gas Company, Newark, N. J.

Vice-Chairman—E. J. Tucker, Consumers Gas Company of Toronto, Toronto, Canada

HERBERT E. CLIFF

Report of Accounting Machines Committee

PHILIP J. SWEENIE, Chairman
The Peoples Gas Light and Coke Company, Chicago, Ill.

For several years accounting machines and their current developments have been discussed by the Accounting Section with the purpose of determining their practical application to public utility accounting problems.

This year your committee agreed that the most logical approach to its job would be to submit articles prepared by manufacturers of office machines describing actual installations. This, the committee felt, would afford a broad treatment of our subject with more practical value to the companies interested.

The following papers are offered by leading manufacturers of office machines. The articles were prepared in collaboration with these companies, and your committee hopes the idea outlined in these papers may be helpful in solving some pending problem.

Addressograph Machines

Storeroom Inventory System
Pacific Gas and Electric Company
San Francisco, California
using
Addressograph Equipment

Billing Machines

Register Sheet Method of Customers' Billing and Bookkeeping
The Brooklyn Union Gas Company
Brooklyn, New York
using
Remington-Powers Hook-up

Stub Plan of Customers' Billing
The Peoples Gas Light and Coke Company
Chicago, Illinois
using
Burroughs Public Utility Billing Machines

Stub Plan of Customers' Billing
The Nashville Gas and Heating Company
Nashville, Tennessee
using
National Public Utility Billing Machines

Calculating Machines

Use of Monroe Calculating Machines
at
Consolidated Edison Company of New York, Inc.
New York, New York

Tabulating Machines

Mechanized Stores Accounting
The Philadelphia Electric Company
Philadelphia, Pennsylvania
using
International Business Machines Corporation Equipment

Report of Office Management Committee

WESLEY N. GEITER, Chairman
Consolidated Edison Company of New York, New York, N. Y.

Health Promotion Activities

This report is intended as an introduction to a subject which the committee believes to be worthy of intensive study. It cites the tremendous cost of illness in industry, expresses the opinion which it later substantiates that the gas industry is paying its share, and traces briefly the development of industrial health activities within the past century. An interpretation is made of the Public Health Service Table 1 which, presented as an exhibit, shows the number of disabilities per 1,000 employees during the year 1934 compared with 1933, and the average for the five years 1929-1933. Also discussed is a tabulation, compiled on the basis of a questionnaire, of factors tending to indicate the variability of health promotion methods in the gas industry. The report comments on the nature and frequency of office employee ailments, and outlines briefly the advantages of adequate health service for this group of employees. In conclusion, it is recommended that further study be made of health service costs, lost time allowance, and all other data pertinent to an intelligent appraisal of conditions within the industry.

Correspondence Improvement Plans and Correspondence Manuals

This report contains detailed suggestions for the establishment of a correspondence improvement plan;

and the development, maintenance, and use of reference manuals necessary for the success of such a plan. In its discussion of a correspondence improvement plan it covers such subjects as style manuals, bulletins, inspections, and group instruction for correspondents. In outlining the development of a form-letter or representative letters manual, the report stresses the desirability of comprehensiveness, compactness, and careful and thorough indexing. Exhibits are offered which indicate the possible content of style manuals, bulletins, and representative letters manuals. In concluding, it is stated that experience has proven the value of correspondence improvement plans and manuals, both as a means of effecting material savings in correspondence costs and in furthering good customer relations.

Report of Customer Accounting Committee

R. B. MILNE, Chairman
Columbia Gas & Electric Corporation, New York, N. Y.

This report covers the following subjects:

Effect of Recent Economic Conditions on Collection Methods
Continuous Turn-on and Turn-off Service Order System
Methods of Ascertaining and Maintaining Correct Customer Names

Effect of Recent Economic Conditions on Collection Methods

This report summarizes the collection experiences of forty-three gas companies during the last six years; a period of economic stress and change.

The objectives of all companies have been to reduce losses from bad debts, to hold collection expenses to the minimum and to maintain or improve the standard of public relations.

First Notices

The policies regarding the mailing of first notices for one month's bills before the next month's bills are mailed have undergone slight change since 1929. The figures, the same for 1936 as for 1929, are: First notices mailed for one month's bills by thirty-two companies out of the forty-three.

One company which discontinued the practice of mailing notices for one month's bills several years ago submitted figures which show that the discontinuance of such notices had no adverse effect on collections and resulted in a substantial saving in clerical labor, stationery and postage.

Partial Payments

Practically all of the companies reported substantial increases in the number of partial payments received. This is to be expected in times of economic stress. There remains the problem of re-instilling prompt payment habits in those customers who have become acustomed to free and easy payment methods.

Quarter Meters

The use of quarter meters has just about passed out of the picture. One company reports about 6% and one company about ½ of 1% prepayment meters. The other companies report none or an insignificant percentage.

Weekly Collections

The trend of weekly collections is down slightly. It seems that the advantage of improved collections which this plan provides is more than offset by its inconvenience and by the increased accounting and collection expense.

Deposits

The active deposits of the reporting companies decreased about 10% during the period 1929 to 1936 inclusive.

Check of Applications

One of the best methods of collecting accounts that have been previously charged off and at the same time of spotting customers from whom deposits should be collected is that of checking all applications against a record of bad debts.

Customers' History File

The use of a complete customers' history file is gaining considerable acceptance. A credit rating and a full history of each customer's account is usually kept in this file.

Bonus Plan for Collectors

It is extremely difficult to supervise a large group of collectors working in the field. In order to eliminate the necessity for much supervision and to reward the more efficient collectors, five of the companies have installed bonus plans for collectors. One company discontinued the use of a collectors' bonus plan in 1933.

Disconnections for Non-Payment

From the figures and comments submitted, the gas companies of the country have liberalized their shut-off policies to quite an extent during the period of economic readjustment.

This report shows the enduring success that has followed the adoption of collection policies based on the foundation of being firm but fair.

Trend of Collection Expense and Uncollectable Bills

Year	Collection Expense	Uncollectible Bills
1929	100. %	100. %
1930	97.4	101.5
1931	105.6	124.4
1932	116.3	177.7
1933	123.0	183.6
1934	121.6	117.0
1935	120.5	90.2

Continuous Turn-On and Turn-Off Service-Order System

This is a description of the Service Order Card System operated by the Philadelphia Electric Company by means of which the Company has at all times available complete information respecting all of the locations served by its 788,000 meters. The special features of the system contribute materially toward expediting service to customers when moving from one premise to another.

Methods of Ascertaining and Maintaining Correct Customer Names

There are outlined in this report the preventive measures which, if incorporated in the office routine, would tend to reduce errors in the spelling and recording of customers' names to a minimum. Stress is placed upon the importance of maintaining correct customer names not only from the standpoint of accurate records, but also from the standpoint of maintaining good customer relations.

(Accounting Report continued on page 80 and 82)

Commercial Session

1936–1937

Chairman—F. M. Banks, vice-president, Southern California Gas Co., Los Angeles, Calif.

Vice-Chairman—Hugh Cuthrell, vice-president Brooklyn Union Gas Co., Brooklyn, N. Y.

F. M. BANKS
Chairman-Elect

Promotional Rates and Their Effect

HUGH H. CUTHRELL
The Brooklyn Union Gas Company, Brooklyn, N. Y.

Promotional rates must be intelligently planned. Hit or miss or general action is likely to result in disappointment. The rate must be of such a promotional form that the customers can see that by using the service to a fuller extent he will effect a saving.

For nine months of this year the dollar value of our appliance sales is $602,800 greater than last year. In 1935 the dollar value was $128,582 more than 1934. Our domestic appliance sales of $2,161,600 for the nine months of 1936 consisted of the following units:

8,234 ranges
7,661 refrigerators
3,066 water heaters
1,577 house heating

In the corresponding nine months of 1935 we sold 814 water heaters and 31 house heaters. The increase this year reflects the study we gave to devising our promotional rates and the aggressive merchandising we did after the rates went into effect.

Customary price standards have been maintained in selling these appliances. They have been sold at a price comparable with that which any independent dealer or department store would set.

Our New Business Department estimated that in three years it could increase gas volume by three billion cubic feet of gas sales. In nine months' operation under the new rate structure we have attained an annual volume of new business of more than one billion cubic feet.

Our experience with our new rates indicate that promotional rates add volume gas sales when these rates have been properly designed and when they are enthusiastically promoted by a well-organized sales force and intelligent advertising. We expect to have to fight for every bit of new business in the future. Yet we believe that with our new rate schedule, our sales organization and above all the enthusiasm and loyalty of our employees in all departments we can give a good account of ourselves.

Presented before A.G.A. Convention October, 1936.

Broader Viewpoint of Home Service

E. M. THARP
The Ohio Fuel Gas Company, Columbus, Ohio

What our customers think we are is of greater importance than what we really are. We must know firsthand and directly what they think and why they think it. Home Service has been, with our organization, not only the best means of learning these impressions and opinions but the most direct and effective instrument of corrections.

Unless we have this larger conception of the possibilities of a Home Service organization, then we may have a limited and circumscribed understanding and appreciation of Home Service. Home Service with us is the eyes and ears of management and to the customer the voice of the company.

The Home Service girl is available, when properly trained, to call on customer or employee in his home and to learn through natural conversational approach of harmful practices or expressions, and where and how they occur. Through her report and conference, such conditions can be made an immediate matter of management.

The public craves attention in service. It is not enough to provide uninterrupted and adequate supply of gas fuel in uniform quality. Marvels in mechanics have become so commonplace as to dull the sense of wonder and appreciation in the average man. Advertising and propaganda have become so widespread and, despite surprising cleverness, so obvious, as to lose much of their effectiveness. Human nature, however, still responds to human nature. It still reacts to personal attention and service, to personal explanation and to personal appreciation.

Home Service makes the business of selling gas personal and human. It provides the human touch that gratifies.

Plans and Methods of Hitting the New Home Market

R. S. AGEE
Washington Gas Light Company, Washington, D. C.

New Construction for the first 9 months of this year has already exceeded new building for all of 1935 by 23%. Contracts awarded for Residential Construction for the past August registered the largest monthly total in more than five years! 70% of all these new homes are single and two-family dwellings, with an attendant gas revenue 116% greater per home than that of an apartment house dwelling unit. Think what this tremendous market could mean to us!

Roy W. Wenzlick, President of the National Association of Real Estate Boards, says:

"A Real Estate Boom in the U. S. is inevitable. Greater Profits (Possible Gas Load to You) will be made during the next few years in this field than can be realized again for several generations."

Bottled Gas—an Ally

H. EMERSON THOMAS, President
National Bottled Gas Association, New York, N. Y.

Because of the fact that the Manufactured and Natural Gas Industries distribute their products through mains the territory which they may serve economically is somewhat restricted. A vast unserved market has been opened up as a great frontier of development by the Bottled Gas part of the Gas Industry.

While approximately 20,000 users enjoyed Bottled Gas Service in 1928, this number had increased to approximately 250,000 in 1935. The reasons for such a rapid increase were:

1st. A lowering of the initial cost to customer from outright sale price on equipment of $150.00 or $200.00 to an installation charge (marketer owning equipment) of $36.50, and for the past two years a consumer has been able to secure gas service beyond gas mains for only $9.75.

2nd. Gas prices were reduced to a top price of $.12 per pound (approximately $2.00 City Gas) with lower prices for large quantities.

3rd. Appliances of high efficiency were demanded and marketed by the majority of the marketers.

4th. Service to the user was improved. This was essentially by giving the customer an uninterrupted supply of gas, either by a tank truck delivery system or by an automatic regulator changeover device which turned on the reserve cylinder of the two cylinder type equipment when the initial cylinder became exhausted. Another added improvement was the monthy billing of the user for gas consumed rather than such user purchasing a cylinder of gas in advance.

The Bottled Gas Industry has carried on intensive research into equipment improvements, delivery methods, merchandising, plans, dealer cooperation, appliance efficiency, rate making, etc. to better meet competition outside of the gas industry.

The Bottled Gas Industry believes that for the greatest value to be obtained the entire Gas Industry should and will co-operate to the fullest in order to take an aggressive attitude toward outside competition. We feel we are all competing, not with each other, but with other industries who are trying to obtain the prospects' dollar, whether it be for an automobile, a radio, a vacation or a membership in the golf club.

As the Bottled Gas Group pushes forward in its attack on the Gas Sales Frontier, it is developing customers that may later be served by gas mains. This widespread aggressive activity is selling the Gas Idea and will help keep Gas paramount in the public's mind as The Fuel.

The picture warrants the fullest co-operation from all of the Gas Industry in Selling Gas.

This can be accomplished in the following ways:—

1. Advertise gas as the fuel on the mains and beyond the mains.
2. Cooperative sales schools.
3. City Gas groups display Bottled Gas equipment to prove to public gas is available anywhere.
4. Continue work of increasing appliance efficiencies on Bottled Gas as well as City Gas and Natural Gas ranges.
5. Appliance manufacturers advertise "Modern Gas Appliances Available Beyond Gas Mains through Bottled Gas."
6. Institute an educational program to Gas Companies and their employees so as to get the entire industry awake to the necessity of publicizing Gas as the Universal Fuel.

Report of Home Service Committee

BEATRICE COLE WAGNER, Chairman
The Philadelphia Gas Works Company, Philadelphia, Pa.

Home service is a promotional and good-will department. In most cases it is a division of the sales department of the gas company, operating under the direction of the sales manager, and closely affiliated with the service department.

Although home service is not engaged in direct selling, it plays an important part in the merchandizing of gas appliances through indirect selling. Furthermore it should increase good public relations between customer and gas company. Therefore, it is the aim of home service to find ways and means to reach the customer so as to arouse or stimulate the desire of the customer for new gas appliances; to help increase the consumption of gas by encouraging greater use of existing appliances and to help keep customers satisfied through follow-up calls in the home.

Industrial Gas Session

1936–1937

Chairman—Ralph L. Manier, industrial heating engineer, The Syracuse Lighting Co., Syracuse, N. Y.

Vice-Chairman—Hale A. Clark, Detroit (Mich.) City Gas Company

RALPH L. MANIER

What Factors Should Govern the Decision of Gas Companies in Purchasing or Building Industrial Gas Equipment

LEO J. SULLIVAN

Rochester Gas and Electric Corporation, Rochester, N. Y.

In days gone by it was sometimes a necessity for gas company engineers to undertake the design, layout and erection of gas furnaces, because essential features of good design and economical operation were not obtainable in much of the equipment offered by manufacturers.

We were then, as now, confronted with competition from low unit cost, low form value fuels, and these fuels may not need competent engineering organizations to assist them in marketing their products. On the other hand, the high unit cost, high form value fuels have always needed high types of talent to enable them to assist in the sale of their products. These organizations must offer to the consumer a service that provides him with superior appliances. Their successful efforts can be a substantial help to us, and our ultimate success would seem then to depend largely upon cooperation between the consumer, manufacturer and the gas industry.

There may be a question in some minds as to whether we are justified in endeavoring to sell new equipment as a complete service to the customer rather than to just assist him with rebuilding existing equipment and possibly adding some necessary auxiliary equipment. Invariably when improvement of product is involved it will be to the advantage of the customer to purchase complete new equipment. Before a proposal is made it is customary for the furnace manufacturer to study all of the conditions involved and the proposal, when once turned over to the consumer, represents a complete analysis of the whole proposition. The furnace manufacturer has an organization and experience to make this job a success and is able to produce certain good results mainly because he has been given control of all conditions involved.

There are equipment manufacturers who have, over long periods of time, by personal contact, by advertising and by the character of their appliances and gas apparatus, sought to build a successful gas industry.

These manufacturers should receive our consideration and our orders.

Other manufacturers who make equipment for all sorts of fuels are "fair weather" friends who will desert you on little provocation.

It seems very clear as we review our experiences in the past and the development of the field of gas utilization, that the equipment manufacturer is an essential element in our progress.

It is also clear that as we view the future and its ever increasing complexities that the manufacturer who wholeheartedly devotes himself to the solution of the gas industry's problems is going to be even more necessary to us if we are to continue our progress.

What the Gas Industry Now Has to Offer in Commercial Cooking Appliances

W. FRANK ROBERTS

Standard Gas Equipment Corp., Baltimore, Md.

This paper dealt with the benefits of heat controlled ovens and the use of special cooking appliances in place of ranges for certain kitchen operations such as deep-fat frying, etc. Special cooking tops have met with enthusiastic reception.

Chain stores use gas cooking equipment almost entirely. They find its appearance and performance is superior to that of electric equipment.

Combustion Controls for Gas Fired Boilers—Their Importance to Users and Utilities

L. S. REAGAN

Webster Engineering Co., Tulsa, Okla.

The most common arguments of the gas companies against the sale and use of controls are as follows:

1. That the higher cost of equipment makes it more difficult to close contracts for the sale of gas.
2. That the more equipment installed on a boiler for gas firing the more service work required of the utility.
3. The resistance of engineer or fireman to the use of controls on account of his being afraid that he will lose his job.
4. That fuel savings (estimated) do not warrant the additional cost.

My answers to the above are as follows:

1. If the customer is of such a type that he cannot be convinced that he will benefit by the use of controls and first class equipment he will make a relatively poor customer and will take every opportunity to ask you for a lower rate. Finally if he does not get it he will discontinue the use of gas, as his investment in equipment is small and therefore his loss of investment will be small. Then you would have your money tied up in the service lines without receiving any revenue. It is an interesting and an established fact that the oil burner salesmen sell their burner equipment complete with controls at a price from 33⅓ to 50% higher than gas burner and control equipment and do a good job of it. This indicates that in a great many cases the gas company salesman does not have the ability of the oil burner salesman, and if such is the case steps should be taken to correct it.

   To overcome this so-called handicap of high cost of equipment there are many companies that try the policy of first selling the customer gas burners only to get him used to burning gas and then later try to sell him controls. In 95% of the cases brought to my attention this policy has failed because the customer immediately wants to know why he was not told in the first place that he would need controls. The result is that either one of two things happen. Either the gas company reduces the rate or furnishes the customer controls free of charge or at a small per cent of their actual cost.
2. In the matter of service calls a properly installed gas burner installation with the proper controls will require much less service than one without controls. When the control is properly set it will continue to function for a long period of time, making only periodical inspection calls necessary, while if there are no controls or improper ones then—if the gas company has the customers' welfare at heart they will, or should—have someone make frequent flue gas analysis and inspections. This not only takes time but makes customers wonder why so much attention is necessary and what would happen if the company did not continue this policy.

   Another cause of service calls is that of eliminating vibration which occurs in gas fired boilers, especially of the heating type, whenever there is a drastic change in barometric or wind conditions. This vibration can be eliminated by the use of proper controls. If no controls, or improper ones, are in service then as soon as this condition exists, the average customer immediately calls the gas company and asks for service.
3. In discussing the use of controls with the engineer or fireman the matter of labor saving should not be advocated on the basis of eliminating a man or men. Instead he should be approached from the angle that, due to the control, his attention to firing the boiler will be less. This will permit him to properly maintain the balance of his equipment, keeping it more efficient, thereby making a saving which, in 90% of the cases, will amount to more than the salary of the man if he were eliminated. If you approach this subject in the above manner your troubles from this point will be very few.
4. Every installation cannot justify the use of controls when fuel savings alone are considered. But there are other savings that must be considered. These savings come under the following:
   1. Increased production due to constant steam temperature and pressure.
   2. Decreased maintenance and labor.
   3. More time to give to operating and maintaining other plant equipment.

   For example, in installations where steam is used for processing work in such plants as laundries, oil mills, rendering plants, alcohol plants and others of this type, a constant steam pressure, as well as constant CO_2 must be maintained because a drop in steam pressure means a loss in heat of the steam, which in turn reduces the amount of material processed.

Today's Method of Selling Natural Gas to Commercial and Industrial Customers

E. P. KRAMER

Atlanta Gas Light Co., Atlanta, Ga.

There are so many angles to be considered in methods of selling natural gas that I have found it difficult to arrange a coherent order in this paper. The points which I will cover therefore, are not arranged in order of their importance but are given here for your consideration with the idea that some of them may be of value. The methods to be considered include:

1. Sales Organization
2. Sales and Engineering Data
3. Principles of Salesmanship
4. Advertising and Publicity
5. Market Analysis and Rates
6. Development of New Markets

Engineering Improvements in Industrial Gas Apparatus and Their Economic Effect

OLIVER LLOYD MADDUX
United Gas & Fuel Co., Ltd., Hamilton, Ontario

Within the last few years the adaption of convection heating has grown by leaps and bounds. Convection and recirculation have been applied to core baking, drawing, japanning, annealing of steel, aluminum, brass and other nonferrous metals, at temperatures up to 1,400°; and there are many reasons why these operations can be more satisfactorily accomplished in this manner. Due to the constant intimate contact that the convection medium has at all times with the work to be heated, temperature distribution is more uniform and operating results entirely successful and economical. Applications of this method of heating have been made in both batch and continuous belt conveyor units. In the continuous type of unit the work is sometimes carried through on a belt, sometimes in baskets and in the case of small parts, springs, etc., packed to a depth of several inches.

Another recent development in gas apparatus is the improvement that has been made in small oven furnaces. One manufacturer now constructs a small oven furnace firing top and bottom, venting from the bottom. This method of application insures heat distribution and better control of furnace atmosphere.

One of the newest developments in small tool room furnaces is that type of furnace equipped with atmospheric burners. These oven furnaces are lined with semi, or insulating refractory brick and permit heating to 1,400° F. in 15 minutes' time; and in a little over an hour, a temperature of 2,000° F. can be reached. This application of atmospheric burners has also been made to high temperature pot furnaces for salts and metals where temperatures as high as 1,600° F. are required. This equipment requires no blower, is low in first cost and is ideally suited for installations where air under pressure is not available.

Another recent development in apparatus for the use of gas which will increase our market, is that of the high temperature, low pressure boiler.

In our natural gas districts there is one application of industrial gas which does not want to be overloked, viz.: the installation of gas engines as sources for power.

With natural gas selling at around 5 cents per therm, power can be generated at a cost of .63 cents per K.W.H. using a gas engine and generator. This cost includes lubricating oil, maintenance and attendance with the engine operating at 75% of its rated capacity.

Some Practical Methods of Building and Holding Commercial Cooking Load by the Use of Diversified Appliances

LAWRENCE R. FOOTE
Central Illinois Electric and Gas Co., Rockford, Illinois

Close cooperation between the manufacturer of miscellaneous commercial equipment and the gas companies is important. To most of these manufacturers and their dealers the sale of gas is incidental. They are interested only in selling appliances. The men who design these appliances usually know little or nothing about combustion. As a result many inefficient gas appliances are installed on our lines. These appliances give the gas industry a bad eye and are a fine target for our competitors. Therefore the gas industry should lend these manufacturers engineering assistance to help them design efficient gas units and further develop the field.

Hair Dryers

In the last two or three years we have acquired a very desirable load from hair-dryers in beauty shops. Speed and economy are the chief factors in the swing to gas. Each local gas company should make a survey of all beauty shops and work with the manufacturer's representative to convert to gas those shops still using electric dryers.

Water Heaters

Every beauty shop should also be equipped with a gas water heater.

More attention must be given to counter appliances in counter food service stores.

Water heaters for barber shops, singeing burners, boiling kettles, smoke houses for butcher shops, coffee and peanut roasters for wholesale grocers, are a few of many other load possibilities.

The development of the conversion heater, the faucet heater, the new wall type instantaneous heater, and the small seven gallon storage heater gives the salesmen a type of gas water heater applicable for any requirement in the all commercial places. Most communities have laws which require hot water in all establishments handling either food, drinks or money. The opportunities to sell gas water heaters are as great in commercial stores as in the home and in many companies the opportunity has been sadly neglected.

Flood Lighting

Some New England companies have gone in for gas flood lighting. There have been some kinks to iron out, but they are slowly being eliminated. It now looks like we are ready to really go places.

There are now approximately 200 floodlighting jobs in New England. It might interest you to know that some electric men are a little anxious about our activities. Gas companies will do well to investigate gas floodlighting if they really want to increase their commercial load.

Refrigeration

Commercial gas refrigeration will be offered to us soon. Will the gas companies accept and promote it?

GEORGE E. WELKER

NATURAL GAS DEPARTMENT

1936–1937

Chairman—George E. Welker, president, United Natural Gas Company, Oil City, Pa.

Vice-Chairman—Robert W. Hendee, Colorado Interstate Gas Company, Colorado Springs, Colo.

Commercial Aspects of the Unitary Thermal Polymerization Process

J. S. CAREY
The M. W. Kellogg Co., New York, N. Y.

A great deal of attention has been focussed during the past several years on the various methods now available, based on proven full scale operation, for conversion of the lower boiling hydrocarbons from refinery residues and natural gas into motor fuels.

The unitary thermal polymerization process employs no catalyst, accomplishing the conversion by the use of heat and pressure in a single continuous conversion coil. It can utilize as charging stocks either entirely saturated hydrocarbons as obtained from natural gas and gasoline operations, or mixtures containing appreciable quantities of unsaturates as obtained from refinery gas. The materials converted from these sources are principally C_3 and C_4 hydrocarbons.

Characteristics of Product

The raw liquid polymer produced has an A.S.T.M. endpoint temperature of 440 to 550° F., with a sharp "tail" at the higher end of the distillation curve. The 400-450° F. endpoint material separable from the total polymer by an ordinary degree of fractionation in the re-run operation will represent from 90 to 97 liquid volume per cent of the total polymer liquid, the ratio of gasoline to total polymer being influenced by plant operating conditions and the character of the feed stock.

The portion of the total polymer boiling in the motor fuel range is characterized by:

1. High volatility (30-50% evaporated at 158 F., compared to 20-25% for ordinary motor gasoline).
2. High octane number—77—78 C. F. R. M. for the straight polymer gasoline is normally obtained under present commercial operating conditions. The term "blending value" has little practical significance as applied to polymer gasolines.
3. Ease of treating. Polymer gasolines from this process have been found to be extremely susceptible to vapor phase clay treating. A slight appreciation in octane is usually obtained upon treating with a stable 30+ color and low copper dish gum.

Thermal polymer gasoline may be used directly for motor gasoline, but it is evident that its present most economic use is as a high quality blending agent in conjunction with base stocks, either straight run or cracked. Its greatest economic value is attained in the preparation of blends for premium grade gasolines, or in the case of natural gasoline manufacturers the direct marketing of motor fuel with premium characteristics.

Operating Costs

Based on a plant designed to produce 1,500 bbls. of polymer gasoline from a liquefied feed stock containing 30% C_3H_8, and 70% C_4H_{10}, (all saturated) a direct operating cost of 1.08 cents per gallon of polymer gasoline may be derived including the following direct costs:

Operating labor—4 men per shift @ 88c/hr., average

Maintenance @ 4% per year

Fuel 10c/MM B.t.u. (60c per bbl. fuel oil equivalent)

Low pressure steam @ 10c/M lbs.

Power (all pumps motor driven) @ 0.6c/KWH

Water @ ¾c/M gal.

On a fuel basis of 10c per 1,000,000 B.t.u. the liquefied charging stock can be appraised at approximately 0.93c per gallon. Using this charging stock value and taking fuel credit for the tail gas from the polymerization unit, a manufacturing cost before fixed charges of 2.21c per gallon of polymer gasoline is obtained.

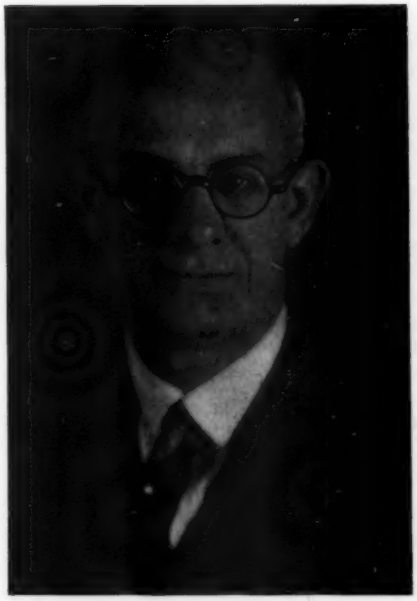
Conclusions

1. The unitary thermal polymerization process has been proven by extended full scale operation to present no unusual operating problems, and to permit an on stream time fully comparable to that realized with modern cracking equipment.
2. The process can handle without change in equipment either entirely saturated or highly unsaturated charging stocks.
3. The product is a high octane premium motor fuel constituent which can be finished to a low gum, good color, stable material at extremely low treating expense.
4. In view of the product obtained, operating costs are low with economics favored by low fuel and charging stock costs.

Technical Session

1936-37

Chairman—Martin I. Mix, supt. of distribution, The Peoples Gas Light & Coke Co., Chicago, Illinois
Vice Chairman—J. V. Postles, Asst. to V. P., Philadelphia (Pa.) Gas Works Co.



M. I. MIX

Economic Future of the Gas Industry

ROBERT E. GINNA
Rochester Gas & Electric Corp., Rochester, N. Y.

The major gas appliances in the field that I am discussing are the range, refrigerator and water heater. Each of these major gas appliances is, or at least should be, almost a necessity to the customer, and with such a comparatively low customer saturation in refrigeration and water heaters there is no need for other and new types of appliances. There is plenty of room for expansion in the present appliance field.

The fact that the gas service beats the electric service from the standpoint of cost is not new, but despite this fact, electric service has been making inroads on the gas industry, particularly in the refrigeration field.

Various studies that have been made confirm the conclusion that each and every executive of a combination company should give a few minutes of serious consideration to the facts that when there are existing gas facilities available it is better, generally speaking, to promote gas refrigeration, cooking and water heating than electric, from the standpoint of both the company and the customer. From the customer's standpoint it is better for the following reasons:

1. Cost of appliance
2. Cost of operation
3. Reliability of service, convenience, etc.

From the company's standpoint it is better because there is as much or more net revenue to be obtained in the added load, and a much better chance of retaining the net revenue in the case of the gas service, than there is in the case of the electric service; and because the gas department usually needs net revenue more than the electric department. It is necessary for the company to make little, if any, added capital expenditures with the added gas load, whereas it will be necessary to make a substantial capital investment, eventually if not immediately, when electric refrigerators, ranges or water heaters are added.

In order to give a picture from the standpoint of making available a guide as to new business policies and activities for the future, we have recently made studies to show what various added loads in the case of domestic customers will mean in the way of added net income to the company.

TABLE I
COMPARISON OF GAS AND ELECTRIC SERVICE COSTS TO AVERAGE HOME IN VARIOUS MAJOR CITIES OF UNITED STATES

Cities	Electric Service for Lighting & Small Appliances Gas Service for Cooking, Water-heating and Refrigeration		Electric Service for Lighting, Small Appliances, Cooking, Water-heating and Refrigeration	
	Month	Annual	Month	Annual
A	$7.67	$92.04	$12.39	$148.68
B	8.98	107.76	14.15	169.80
C	7.86	94.32	12.25	147.00
D	7.08	84.96	10.60	127.20
E	3.28	39.36	17.65	211.80
F	6.83	81.96	9.43	113.16
G	6.64	79.68	16.90	202.80
H	6.27	75.24	10.05	120.60
I	7.51	90.12	9.55	114.60
J	8.48	101.76	11.13	133.56
K	3.95	47.40	12.15	145.80
L	4.08	48.96	9.13	109.56
M	4.61	55.32	10.15	121.80
N	7.98	95.76	8.08	96.96
O	9.40	112.80	8.93	107.16
P	5.51	66.12	13.83	165.96
Average of above	6.63	79.56	11.65	139.80

TABLE II
HYPOTHETICAL GAS AND ELECTRIC COMPANY
Assumed Domestic Service Rates based upon Rate Survey of Various Combination Electric and Manufactured Gas Companies

1. Rates

Residential Electric Rate	Residential Gas Rate
First 30 Kwh. @ 6c	First 1500 cu. ft. @ $1.20 per M.
Next 50 Kwh. @ 4c	Next 1800 cu. ft. @ 1.00 per M.
Next 125 Kwh. @ 2c	Over 3300 cu. ft. @ .80 per M.
Over 205 Kwh. @ 1.5c	537 Btu. manufactured gas

Presented before A.G.A. Convention October, 1936.

In the following Table (III) the above assumed rate is applied to the relative thermal consumption values of the major domestic appliances. The new electric refrigerators indicate an increasing efficiency of operation and it may be felt that 50 Kwh. per month is too high. If it is, then we are overstating the gross revenue and net income value of the electric refrigerator in this study and the comparison therefore would become more favorable to the gas refrigerator.

TABLE III
ESTIMATED ANNUAL GROSS REVENUE—MAJOR APPLIANCES

Gas Appliances	Yearly Average Cu. Ft.	Rate	Gross Revenue	Demand
Range	18,000	$1.20	$21.60	*
Refrigerator	21,600	1.00	21.60	*
Water-heater	33,600	.80	26.88	*
Electric Appliance	Kwh.			Watts ϕ
Lighting and small appliances	360	6c	21.60	*
Refrigerator	600	4c	24.00	90
Range	1500	2c	30.00	1132
Water-heater (a)	4200	1.5c	63.00	1000

*—Not needed, for reasons given in 1 and 2, below.
ϕ—Maximum coincident demand per customer.
(a)—Since the gas water-heating service is *continuous* and *unrestricted*, no figures have been made on off-peak electric service.

TABLE IV
RESULTS
ESTIMATED NET INCOME—MAJOR APPLIANCES

Gas Appliances (a)	Added Investment	Gross Revenue	Net after Operating Expenses and Fixed Charges
Refrigerator	None	$21.60	$16.20
Water-heater	None	26.88	18.48
Electric Appliances (b)			
Refrigerator	$22.50	24.00	17.62
Range	283.00	30.00	19.95 (Deficit)
Water-heater	250.00	63.00	4.50

(a) Range omitted as this study applies only to added loads for existing customers and assumes that customer has a range.

(b) Lighting and small appliances omitted as this study applies only to added loads for existing customers and assumes that customer has this service already.

Cost of Service

1. Costs—General

Assumed that for both electric and gas, added loads are for existing customers only and therefore, all so-called "Customer Costs" are disregarded.

2. Costs—Gas

Due to the fact that the usual manufactured gas property is not expanding and has ample capacity for all present and future loads (except perhaps space-heating with which we are not concerned herein) all costs are considered on an increment basis only. In the usual situation particularly so far as the domestic business is concerned, it will not be necessary to increase the payroll or to add investment in either plant or distribution facilities even if the Company should add all of the domestic gas load it can reasonably hope for. The cost of furnishing added load is, therefore, taken as the increment production cost of gas, which is here assumed to be 25c per M.

3. Costs—Electric

Due to the fact that the electric industry is expanding and that any added load which is strictly not "off-peak" will require increased facilities and investment eventually, if not immediately, we may disregard any excess capacity which now exists and it is assumed that the added loads considered herein will entail both added investment and added operating costs. The cost of serving added load is assumed to be 15% of $2500. (added production and distribution investment) per kilowatt of added system load, plus 5 mills per kilowatt-hour (average production cost).

Trends and Developments in Boiler Feedwater Conditioning

SHEPPARD T. POWELL
Consulting Chemical Engineer, Baltimore, Maryland

When steel is in contact with water at the temperatures encountered in steam-generating equipment, corrosion becomes a serious problem. A fact now so familiar as to be almost axiomatic is that corrosion proceeds at a rate which is roughly proportional to the dissolved oxygen content of the water. Accordingly, numerous devices have been developed for separating dissolved gases from water by physical means. It is of interest to note that one large plant has been constructed in this country for the vacuum deaeration of cold water. Boiler feedwater heaters, however, depend on elevating the temperature of the water to the boiling point, where the solubility of most gases approaches zero; and, further, on providing for the venting of the gases and a sweep of steam in such a manner that the atmosphere in contact with the water contains very little of the constituents which it is desired to remove. When these relations are properly maintained, dissolved oxygen may be reduced to a concentration too small to be detected by ordinary analytical methods. Under these conditions corrosion is not generally encountered. However, imperfect control and mechanical defects may permit sufficient oxygen to remain in the water to cause active corrosion, while the Winkler method, because of either its limited sensitivity or improper manipulation, may indicate to the plant operators the entire absence of oxygen. In numerous instances corrosion has persisted in spite of zero oxygen feedwater. A further contributing factor to this phenomenon may be the absorption of oxygen at various points in the feedwater system between the deaerating heater and the boiler.

Chemists at various plants have also made important contributions to analytical technique in the power plant. An example is the Schwartz-Gurney method for determining dissolved oxygen in very small amounts, which automatically eliminates the serious errors to which the older method was subject.

Distribution Committee Report

C. H. BOYD
Chairman Consolidated Edison Co. of New York, New York, N. Y.

The report contains the following sub-committee reports:

Cast Iron Pipe Standards—Progress report.

Meters and Metering—Continuation of work on accuracy at small rates of flow, use of air or gas as testing medium, developments in tin meter construction, meter records, and meter repair cost accounting.

Pipe Castings and Corrosion—Progress report.

Pipe Joints and Pipe Materials—Progress report.

Pipe Expansion and Expansion Fittings—A discussion of the expansion and contraction of underground and exposed pipe lines and the common methods of caring for it.

Use of Copper Pipe for Gas Services, Drips, etc.—A progress report based on an inquiry sent to ten operating companies.

Repairs of Breaks in Cast Iron Mains—A discussion of the various types of breaks and methods of repairing them.

Service Connections to Steel and Cast Iron Pipe—Various methods used.

"Method of Determining the Relation of Generator Fuel, Oil and Tar in the Evaluation of Heavy Oil for Carburetted Water Gas."

H. G. Terzian, United Engineers & Constructors, Inc., Philadelphia, Pa. (appeared in the June, 1936 issue of the *Journal* substantially in the form in which it was given at the A.G.A. convention.)

Report on Pipe Coating and Corrosion

SCOTT EWING, A.G.A. Research Associate
National Bureau of Standards, Washington, D. C.

Field Coating Tests

The report containing the results of the 1935 inspections of the coatings in the field tests was distributed at the Distribution Conference last spring.

The more important conclusions, which are also based upon a study of the American Petroleum Institute's results on operating lines are: (1) The lower economic limit of bituminous coating thickness is about 1/10 inch. The upper limit is variable depending upon the cost and nature of the coating material, the corrosiveness of the soil, and other factors. (2) The choice between asphalt and coal tar base materials depends upon relative costs. Both materials have advantages and faults and good coatings can be made from either material. (3) Whenever possible, hand methods of application in the field should be avoided. (4) Any organic reinforcement in the coating is a possible weakness. (5) External armoring enhances the value of most coatings by protecting them during the backfill and subsequent settling period. (6) It is a difficult but not an impossible thing to protect a pipe line in poorly drained soils, and it is in these soils where severe corrosion is most likely to occur.

Primer Tests in Cooperation with A.S.T.M. Subcommittee on Bituminous Primers

The panels, coated with two cross-brushed coats of the primer, were mounted on a test rack on the roof of the Institute of Paint and Varnish Research. The rack is so constructed that it can be lowered into a tank of salt water during the night and exposed to the direct rays of the sun during the day.

The following conclusions seem to be established from the mechanical and thermal tests:

1. The behavior of a panel in these tests is determined largely by the hot coating and to a less extent by the primer. Asphalts behave much better than either asphalt enamels or coal tar enamels.

2. Asphalt primers are not suitable for coal tar enamels and coal tar primers are not suitable for asphalts or asphalt enamels.

3. There is one case where a particular enamel seems to require a particular primer. Except for this case, any asphalt primer seems to be suitable for any asphalt or asphalt enamel, and any coal tar primer seems to be suitable for any coal tar enamel.

4. Pre-treatments of the steel did not greatly improve the performance of a primer and hot coating in these tests.

The results of the weathering tests indicate that the so-called spraying oil and asphalt primers are much less durable than coal tar base primers.

The Deterioration of Bituminous Materials in the Soil

In the various reports on bituminous coatings it is often stated that some materials appear to undergo changes, i.e., they appear to deteriorate and lose their protective qualities. This weathering effect is in general more noticeable with asphalts than it is with coal tar materials, and this is one of the reasons coal tar products appear to be preferable to most asphalts.

The Ball and Ring softening point is an excellent means for measuring a change in bituminous materials because only a very small sample is required and the measurement is easily and quickly made. Weathering or deterioration is indicated by an increase in the softening point.

The increase in the softening point of the asphalts probably depends upon the thickness of the coating and upon the soil in which it is exposed, as well as upon the nature of the asphalt.

SOFTENING POINTS OF BITUMENS FROM BUREAU OF STANDARDS
Coated Pipe Specimens (12 Years' Exposure)

Kind of Coating	No. of Samples	Softening Points in Degrees C. Original	Exposed Specimens Minimum	Exposed Specimens Maximum
Asphalt dip	10	85	112.5	127.5
Fabric reinforced asphalt	7	102	113.5	125.3
Heavy asphalt dip	19	102–107	108.4	133
Fabric reinforced asphalt	5	102–107	112.2	127.6
Fabric reinforced coal tar pitch	29	Unknown	88.9	96.7

Report of Chemical Committee

LOUIS SHNIDMAN, Chairman

Rochester Gas & Electric Corporation, Rochester, N. Y.

This report contains the following papers and subcommittee reports:

"Method of Identifying Explosive Gases Found in Small Concentration." A sample of the dry contaminated atmosphere is first measured in a Haldane Burette over mercury. After this, the carbon dioxide and other alkali soluble gases are removed. The remaining sample is burned by slow combustion and the contraction and carbon dioxide are measured. From these data, the ratio of the contraction to the carbon dioxide is calculated. This ratio is then compared to similar ratios of known gases, such as coke, oven gas, carburetted water gas, natural gas, producer gas, reformed gas, sewer gas, propane gas, butane gas, gasoline, and benzol. From this comparison, the identity of the unknown gas is determined. Each type of gas has a different ratio due to the variation in composition. To use this method, it would be first necessary to determine such ratios for each of the gases named above, or other gases encountered in this work.

"Determination of the Oil Fog Content of Gas—An Abstract of Published Methods."

This includes mention of the orifice device, the ultramicroscope, the dye test and of the various quantitative procedures.

New Developments. This includes a discussion of oil cracking in water gas making.

Blast Furnace Slag for Dry Box Purification. No outstanding differences between slag and shavings oxide have developed in regard to operating procedure, cleaning of traces, rate of flow, back-pressure, etc.

The gain has been increased capacity, lower cost, and reduced fire hazard.

The effect of HCN on Oxide and H_2S Efficiency. The conclusion from a study of two batches of oxide that the cost of removing cyanogen in the purifying boxes is almost equal to the cost of removing sulphur, or in other words that removal of cyanogen prior to the boxes would almost double the life of the oxide.

Hydrocarbon Hydrates.—Natural gas hydrates are found in pipe lines in the presence of liquid water under certain conditions of temperature, pressure and gas composition.

Meter Diaphragm Dressings and Meter Diaphragms.—A consideration of the fundamental requirements of diaphragm dressings, the materials used for dressings and sheep skin substitutes.

Nitric Oxide and Methods.—A discussion of the methods of expressing concentrations of nitric oxide in gas.

The Purification of Commercial Gases at Elevated Temperatures

WILBERT J. HUFF* and LLOYD LOGAN*

I. The elimination of organic sulfur.

II. The simultaneous removal of hydrogen sulfide and organic sulfur.

Part I

The occurrence and characteristics of organic sulfur in gas, the deleterious effects of its products of combustion, the reasons for desiring its removal, and the advantages sought in directing efforts to the use of high temperatures and to the search for catalysts capable of converting organic sulfur to hydrogen sulfide are indicated.

Typical methods employed in the preparation of the catalysts are outlined, together with the apparatus and methods for carrying out the comparative tests.

Summarized results are given of (1) preliminary experiments carried out with various catalysts employing commercial blue gas free from hydrogen sulfide, (2) tests with synthetic gas mixtures containing thiophene, (3) tests with synthetic gas mixtures with moderate amounts of added carbon disulfide and hydrogen sulfide, (4) tests with a large amount of carbon disulfide added, and finally (5) continuous tests on the most promising catalysts both with commercial blue gas free from hydrogen sulfide and with blue gas containing hydrogen sulfide. This work resulted in the discovery of several catalytic mixtures of high activity of which the most satisfactory, prepared from mixtures of uranium oxide and cerium or copper oxide, exceeded in activity any previously proposed catalysts known to the group and possessed good physical properties.

Part II

Efforts were turned towards the simultaneous removal of hydrogen sulfide and organic sulfur at high temperatures by a cyclic process involving alternate absorption of sulfur from the gas by a purifying material and revivification of the purifying material by the action of an oxygen-containing gas.

Preliminary experiments with iron oxide and with copper showed them to lack the required characteristics. A systematic laboratory investigation of many types of materials, chiefly mixtures of metallic oxides, indicated those containing copper with one or more other metals, such as chromium, vanadium, or uranium, to be promising.

A further extensive investigation directed toward the development of a suitable ceramic binder to enable the active material to withstand plant use indicated suitably baked copper—vanadium— clay and copper —chromium—clay mixtures to give best results.

On the basis of laboratory tests in which substantially complete removal of both the hydrogen sulfide and organic sulfur was accomplished at a temperature of 450°C. (842°F.) at high space velocities, a small apparatus containing small rings of the preferred mixtures was installed in 1928 at the Spring Gardens Plant of the Consolidated Gas Electric Light and Power Company of Baltimore. In this apparatus, operated automatically in unison with the water gas cycle, the purifying material was subjected alternately to the action of carburetted water gas during the up run and to the revivifying action of air during the blow period. Promising results with this apparatus led to the installation of a similar but larger apparatus through which, however, both up run and back run gas was passed.

(Continued on page 80)

*Wilbert J. Huff, Professor, Gas Engineering Department, Johns Hopkins University, Baltimore, Maryland.

*Lloyd Logan, Associate Professor of Gas Engineering, Johns Hopkins University, Baltimore, Maryland.

Roots
CONNERSVILLE

GAS BOOSTERS

driven by your choice of power

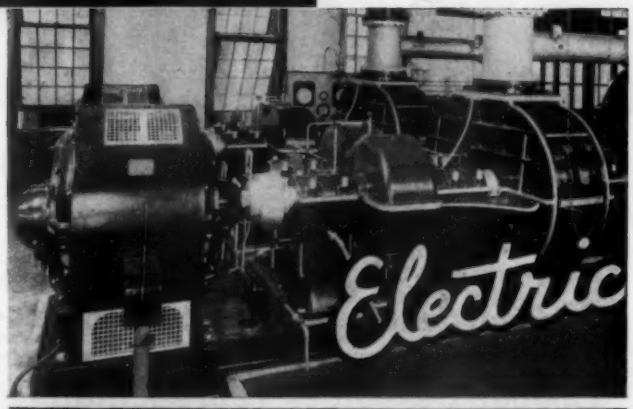
With an "R-C" Gas Booster you may choose the kind of power that convenience, economy and dependable operation make most desirable for your particular installation—direct connected to gas engine, steam engine, or electric motor.

Choice of power is but one of the advantages you enjoy. The modern application of the basic "Roots" principle of positive displacement results in mechanical efficiency and flexibility of control unmatched by other types of boosters.

Top View—Installation at Boston. Boosters direct connected to three-cylinder, vertical, uniflow steam engines. Speed 400 RPM. Capacity each unit 1500M cu. ft. per hour, 7½# gauge.

Middle View — Installation at Chicago. Booster direct connected to six-cylinder vertical gas engine. Speed 400 RPM. Capacity 500M cu. ft. per hour, 8# gauge.

Bottom View — Installation at New Orleans. Boosters direct connected to induction motors by couplings. Speed 575 RPM. Capacity each unit 750M cu. ft. per hour, 10# gauge.



The value of the rugged simplicity characteristic of "R-C" design and construction and the resulting freedom from maintenance costs are well established facts. Years of experience and alert engineering attention to new day requirements in the industry combine to produce the answer to every booster problem. Ask for our suggestions on your next gas booster.

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Connersville, Indiana

TOMORROW'S ENGINEERING APPROVED BY YESTERDAY'S EXPERIENCE

Two electric motors were lifted out. Right in on the same locations went two Cooper-Bessemer Type GN-6 gas engines. Nothing else was changed. The engines drive the same blowers as the motors they replaced. They operate at the same speed. Even the old chains and sprockets were retained. Your plant can be converted to gas power just as easily. It's good economy to use gas engines. Let a Cooper-Bessemer representative tell you more about it.

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Pipe Corrosion and Coatings

Soil Surveys

Part 5

By

Erick Larson

Introduction

SOILS are the fundamental deteriorating agent with which we must deal in the mitigation of corrosion. Soil science provides us with a greater quantity of information regarding soils than can be economically determined during each survey. The enormity of the factors has resulted in conclusions by many that research has produced nothing of practical significance. To the contrary, research has been so prolific that considerable time for intimate study is required to realize the definiteness with which the action of each factor has been determined and the real significance which results from correlation of all the items. The correlation does offer difficulties as interpretation requires expertness.

The present status of soil science as applied to corrosion has definitely passed the theoretical and laboratory stages and has advanced a considerable distance in practical application, but its complexity has restricted intimate appreciation of its value to the few who have been directly connected with the research efforts. Two important steps must be fulfilled before research efforts can be fully capitalized. First, the presentation of the available data in a simplified form to the end that all industries affected will become corrosion conscious and realize the full import and the economic significance of the problem. It is the first accomplishment that is sought in this presentation. Second will be the educating and training of specialists as is necessary in so many phases of each industry.

A prediction of the conclusions which will be reached after fulfillment of the first phase of soil corrosion "Realization" is that the only solution for permanent lines is protection, whether incorporated in the metal or applied. Soil science will then be used to determine the degree of protection for permanent lines, rather than what sections are not to be protected. This conclusion is in agreement with the generally accepted accounting theory of the permanency of the industry.

The primary purpose of soil surveys are economic rather than the collection of physical, chemical and electrical data. Concentration on this purpose will materially simplify operations by excluding extraneous though interesting details and also assist observation by focusing attention on the important factors. The vast quantity of factors requires grouping and simplification.

Survey by Observation

Judgment based on experience, while the method least recognized by scientists, successfully eliminates much costly surveying if judiciously used. Experience surveying should be strictly confined to the areas having definitely easily observed characteristics such as swamps, bogs, cinders, river crossings, oil soaked land, refuse dumps, chemical refuse, etc., all of which are ordinarily highly corrosive. Care is required in establishing the boundaries of such areas, as a high degree of corrosivity does not always end at the visible borders but may extend beneath the surface for some distance. The experience required for this type of surveying may be gleaned from basic engineering education, literature, interviews, personal experience including historical records, etc. The conclusions merely limit the areas in which protection must be applied, as conditions visible to the eye are insufficient to designate the degree of corrosion. The areas to which such methods are applicable are considerably limited and while such a survey may bound the area, selection of the method of protection frequently warrants expert advice.

Historical Record Survey

Having designated certain areas by observation as "Hot Spots" the next simplest, and an economical method when available, is to survey the historical records pertaining to lines which failed from corrosion. When replacements are involved this method results in a fair degree of accuracy in predictions and is valuable in establishing boundaries for areas of varying corrosion intensity. However such records are viewed as actually representing only the conditions in the identical trench from which the pipe recorded was removed unless the factors causing the failure have been included in the record. Extending the areas beyond the confines of the location of the recorded main requires judgment as to the soil uniformity.

In "Hot Spots" historical records indicate the variations to be expected in applying soil corrosion knowledge. Bare steel pipe installed in a swamp had a life, with but few repairs, of four years, while the same type of pipe replacing the original in the exact location had only a two year life. Stray currents were negligible and approximately the same. The variation between lives of pipe in mildly corrosive soils have been less and, therefore, historical records may be more successfully used as the rate of corrosion decreases.

The use of historical records and corrosion surveys previous to complete failure of a line results in less accurate predictions than those based on total life. In previous sections the rate of corrosion was shown to decrease with time. The application of incomplete historical data would therefore be further complicated by the necessity of applying factors, variable in themselves, to compensate for the attained age of the pipe. Determination of the factors would depend upon a series of corrosion surveys conducted over a period of years and plotted to determine the age at which penetration from corrosion would equal the pipe wall thickness.

Science and Soil Surveying

The weaknesses in and disadvantages of surveys based on experience or historical records and facts which historical records disclosed, led to a desire for more scientific explanation of corrosion causes. The first step was a study of the rate of corrosion followed shortly by analysis of surrounding conditions.

An early scientific conclusion but one which has had meagre and slow acceptance among operators in general, was that the forces of corrosion

are continuously destructive to all buried metal structures. The important consideration is, therefore, the rate and practical end point of corrosion.

The original field experiments attempted to determine the reason for specific failures and the state of the art at present is such that there is less difficulty in determining reasons for failures than assigning degrees of corrosiveness to soils in which experience is lacking.

The major portion of efforts to correlate soil data and buried metal life has been on lines whose total useful existence has not exceeded 25 to 30 years. The value of the data becomes increasingly less as the soils decrease in destructiveness. It is possible to predict in many instances the activity of soils in which metal life will not exceed 30 years but in the majority of instances of pipe use by such permanently established utilities as gas, water, telephone, electric, etc., 30 years would seldom be considered a sufficient period of usefulness. A considerable proportion if not a major percentage of buried pipes are in soils which would not prove totally destructive in the first 30 years. As time increases experience with the occasional penetration of mains rather than total destruction more and more emphasis will be placed upon minimizing such occurrences rather than viewing occasional leakage strictly economically. Just as justice must be tempered with mercy, empirical economy must be savored with safety. The intangible factors such as safety are entitled to a relatively important consideration and should not be lost in a maze of more visible physical data.

The electro-chemical theory provides the theoretical concepts with which soil corrosion phenomena may be explained. Consideration must be given to physical properties to explain certain results which might otherwise be considered inconsistencies but which are frequently misinterpretations. While scientific endeavor is continuously increasing the recognized number of destructive corrosive agents, research is also attempting to simplify the number of tests required to produce a method of survey which will have the greatest practical value. Simplification has resulted from endeavors to correlate the rates of corrosion with known physical, chemical or electrical properties of soils. Most chemical properties of the soils may be simply and accurately obtained but precise correlation with corrosion is difficult. However, conclusions reached from thorough soil surveys produce more consistent predictions of results than opinions backed only by extensive experience.

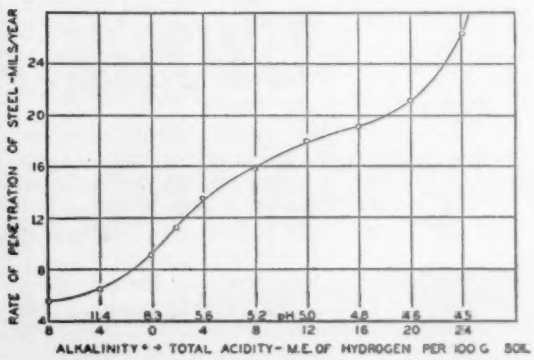

Fig. 1. General Relation Between Acidity and Corrosion of Steel in Synthetic Soil.*

Scope of a Survey

Research has determined such a vast quantity of corroding agents that limiting the scope of a survey becomes of primary importance in obtaining a reasonable cost.

Fundamentally the purpose of outlining the scope should be to select for determination all the active agents known or suspected to exist in the particular area under consideration although the increasing of confidence in suggested methods, thorough confirmation of existing methods by more extensive application and advancement of knowledge through original research must not be neglected when economically feasible.

The general characteristics of soils and surrounding conditions which have been found to affect the rate of corrosion are tabulated without the sequence being related to importance in any particular area.

Chemical
Electrical
Geological
Biological
Climatalogical
Historical
Artificial

Each has sub-divisions whose evaluation as to corrosiveness is of importance.

Chemical Characteristics

Theoretical chemical conceptions of reactions occurring in soils have been described. The three general groups into one of which all soils may be included are acid, alkaline or neutral. All soil groups are corrosive but in general the intensiveness varies from a lower rate in alkaline, increasing in neutral and most rapid in acid conditions. Corrosion of a serious nature may occur in any.

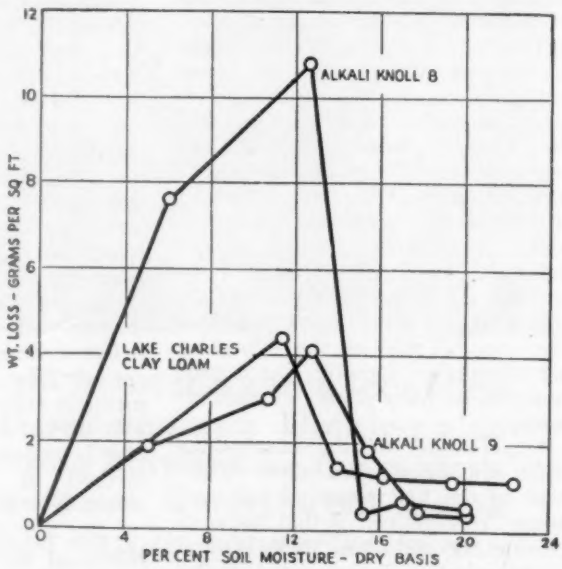

Fig. 2. Laboratory Test of Corrosion Rate in Alkali Soils.*

"Corrosion of Ferrous Metals in Acid Soils" by I. A. Denison and R. B. Hobbs, Research Paper 696 National Bureau of Standards

"Cause of Corrosion in Alkali-Knoll Soils" by Walter F. Rogers. From Proceedings of Fifteenth Annual Meeting, American Petroleum Institute.

Alkalinity

While alkaline soils exist in localized areas in the eastern part of the United States they are more extensively found in the west. Many instances have been recorded of only mildly corrosive alkaline soils but in others and particularly those containing the more soluble salts extreme corrosion is frequent.

The reason for the mildness of corrosion in alkaline and neutral soils frequently is the depositing of a layer of salts on the surface of the pipe which forms a protective film having the effect of inhibiting corrosion. This condition is usually more visible on newly installed pipe due to the more numerous voids on the pipe surface previous to the soil becoming compacted. The observance of a layer of salts on the pipe surface can not be taken as presumptive evidence of a slow rate of corrosion as examination may occur during a comparatively dry period when there is insufficient moisture to dissolve any soluble salts. Following solution the intensity of corrosion may be severe causing a more rapid average deterioration than would occur from continuous exposure to a less concentrated alkaline condition.

The considerable effect of moisture in certain alkali soils is evident from Figure 2, which summarizes laboratory tests on some Texas soils. The results were found to agree closely with field conditions. The rates of corrosion reported by Rogers[1] in these soils were as follows:

Average Annual Pitting Rates Found in 18 Harris County, Texas, Alkali Knoll's

Average Annual Pitting Rate (Mils)	No. of Knolls
0-5	4
15-20	8
30	2
35-40	4

Ordinarily resistivity as a criteria of corrosion of alkali soils is found to vary more than in acid conditions but Rogers found a fair degree of correlation in the Texas soils studied.

Determining the salts causing alkalinity is frequently difficult. A complete chemical analysis of each sample ordinarily taken in a soil survey is usually impractical although at least one firm specializing in corrosion advocates such a procedure. Successful results based on a comparatively few analyses depends upon the accuracy with which other soils are placed in the proper series.

Designating any particular one or group of salts as the active corrosive agent is most frequently impossible although various investigators have found that the most severe corrosion occurred where one or more of the salts of sodium, potassium, or magnesium existed. Salts of the bases mentioned are those most extensively found in nature.

The degree of salt saturation has been only of importance in highly localized conditions, as the difference between the quantity of insolubile and soluble salts present and also the quantity of salts in solution under the moisture conditions existing in a soil are important factors.

The qualitative and quantative salt analyses having but local correlation to the rate of corrosion some characteristic common to all has been sought. Although not entirely satisfactory the conductivity and permeability of alkali soils have given the most frequent correlation. In both instances it may be generally stated that where the tests indicate a potentially high rate of corrosion the conclusion is accurate but indication of non-corrosiveness can not be relied upon with any degree of accuracy.

Salts may play an important role in the absence of free oxygen. For instance sulphates frequently found in soils may be reduced through the action of bacteria. Independent experimentation in England and Canada has established the possible reason for this cause of corrosion. Bacteria require cathodic hydrogen to reduce the sulphates and form hydrogen sulphide which may react with the iron in solution and produce an iron sulphide as well as iron hydroxide. The ferrous sulphide is not deposited on the pipe and, therefore, has no protection value though possessing corrosion resisting properties. Such action will only occur in poorly drained soils. It is interesting to note that oxygen is present but not in a free state.

Soluble salts affect the physical characteristics of a soil by changing the intensity of contraction during drying. A soil high in salts will have a relatively high percentage of contraction which in some soils will be indicated by cracking during the dry season. The contraction of soils has vitally affected the development of pipe coatings. The contraction characteristics of loams and clays are particularly affected by the quantities of salt present. Sufficient force is exerted during the expansion and contraction of some soils to remove or distort the layer of corrosion products which would ordinarily deter corrosion unless disturbed and to rupture the pipe coating used.

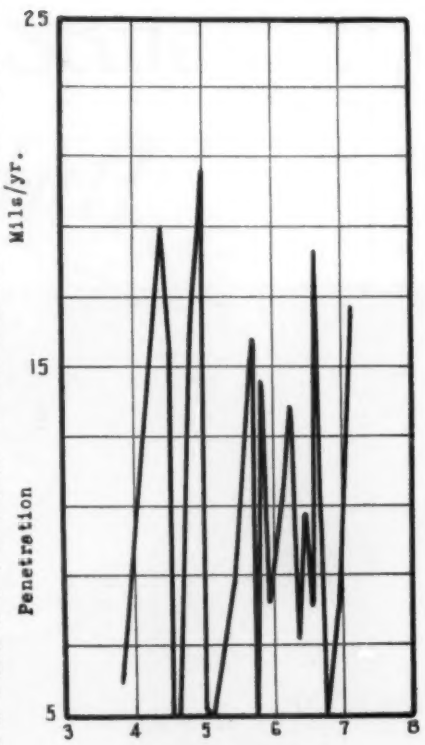

Fig. 3. Relation of Rate of Pitting Hydrogen Ions in the Soil.

Alkalinity is affected by rainfall as in areas of considerable precipitation all soluble salts may be washed out or reduced so as not to be of significance. Even insoluble salts may be physically removed by the washing action of water. In areas of no or slight alkalinity but located in proximity and down grade from sources of salts a particularly heavy rainfall may resupply the area. Geology may therefore be a factor in alkalinity over the lifetime of a pipe line.

The progressive steps in determining the affect of alkalinity would be to establish the fact from records or preliminary tests that the area was in general alkaline. An electrical survey would then indicate sections of low resistivity. Remaining sections would then require chemical analyses to determine the qualitative and quantitative character of the salts. The geology of the area would supplement the determinations of alkalinity. Laboratory accelerated tests would be required to determine the weight to be given all observations.

1. Water—F. Rogers, Chem. Dept., Gulf Oil Company, Houston, Texas, in J. M. Research Laboratory Bulletin.

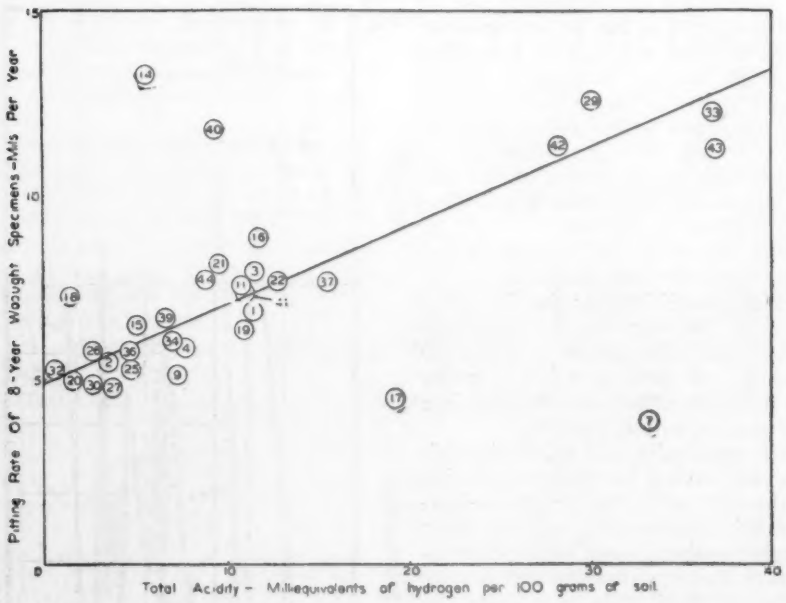
Pitting Rate Of 8-Year Wrought Specimens-Mils Per Year
Total Acidity - Milliequivalents of hydrogen per 100 grams of soil

Fig. 4. Relation between total Acidity and Pitting Rate of Samples in a Burial Test.

Acidity

Acid soils are the most extensive type in the eastern section of the United States although found in all sections. Experience has determined that on the average the most rapid rate of corrosion occurs in acid soils.

The acid concentration as determined by any method is not as important as the existence of an acid. In the laboratory certain relations between corrosion and acid concentration have been shown to exist but in such tests other factors causing deterioration are easily controlled. Also, the acid concentration of soils is usually comparatively small while laboratory tests may be carried from zero to 100 percent without difficulty. Figure 3 indicates the correlation of some ferrous specimens buried by the corrosion division of the Bureau of Standards. The curve was constructed on the basis of average pH value for each given soil and is presented to indicate the detail which must be considered rather than a lack of trend. A single pH value or the average for a given soil type can not be considered as representative in determining corrosion but the maximum deterioration found when conditions are favorable to produce such a condition is the more accurate value for predicting the corrosiveness of an acid soil.

Acidity may be enumerated by the total acidity or the hydrogen ion concentration (pH value).

The pH value is not a direct measure of the quantity of acid or acids present but is a criteria of the acid activity. Determination of the pH value is more frequently resorted to than total acidity, being simpler. Soils having a high percent of colloidal matter frequently cause the total acidity determination to indicate a considerably higher value than is actually true, as the colloidal matter is capable of absorbing large quantities of the alkali used in the test above that required for neutralization. Methods have been devised to overcome this difficulty but their application is more time consuming. The determination of total acidity has been detailed by I. A. Denison in "Methods for Estimating Corrosiveness of Acid Soils in Contact with Iron and Steel Pipe," published in the Oil and Gas Journal of September 29, 1932.

"Method for Determining the Hydrogen Ion Concentration of Soils," by E. F. Snyder in Circular No. 56 of the U. S. Department of Agriculture and the revision in 1935 includes more details than could be described here on laboratory determinations.

For total acidity readers are referred to "Methods for Determining the Total Acidity of Soils," by I. A. Denison in the Bureau of Standards Research Paper 539 published in March 1933. Denison includes data to show a definite correlation between total acidity and pitting rate. Several points are at considerable variance with the average trend but the majority fall within reasonable limits as shown by Figure 4 which is from Denison's paper.

That the difficulty of correlating acidity and pitting rate is in determination of all factors causing corrosion rather than the theory is demonstrated by Figure 5. A generally applicable numerical relationship between acidity and pitting of ferrous pipe cannot be given.

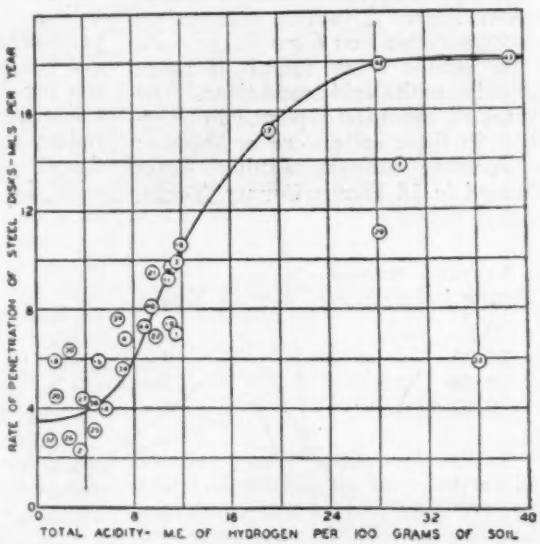

Fig. 5. Relation between Rates of Penetration of Steel in Laboratory Test and Total Acidity of Soils.*

Baylis[2] has determined the quantities of soluble iron existing in natural waters at various pH values. Practically no soluble iron was found in solutions with a pH of 8 in an ab-

"Corrosion of Ferrous Metals in Acid Soils." I. A. Denison and R. B. Hobbs, Nat. Bur. of Standards R. P. 696.

4. "Methods for Determining the Hydrogen-ion Concentration of Soils," E. F. Snyder, Cir. 56, U. S. Bureau of Agriculture.

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sence of oxygen. At a pH of 6.8 several hundred parts per million were found to remain. Baylis also contends that the tendency for iron to enter solution at the pH values of natural waters is of such a high value that the life of iron pipe depends upon inhibiting or retarding factors.

The hydrogen ion concentration may be used as a determination of alkaline as well as acid activity. The

$$\text{pH value equals LOG } \frac{1}{(H+)}$$

where H+ is the hydrogen ion concentration. For pure water H+ equals 10^{-7} and therefore pure water would have a pH value of 7. Values of pH above 7 would indicate an alkaline reaction while below would be acid. While no clear distinction is possible soils having a pH value above 7 are said to be relatively less corrosive than those below 7.

Variations in the pH value of soils occur from a number of causes. The fact that different investigators do not secure the same result may be slightly due to personal idiosyncrasies but more often are the result of impersonal factors. In a single soil type the boundaries of which were designated by an experienced surveyor, variations of plus or minus 25% from average were common. In an acid soil type having variations in pH between 1.2 and 4.5 one group of bare steel services in the lower pH area were replaced in from 10-19 years and in the higher pH section had a life of 4-6 years. However, differences in life and pH values are of no consequence as protection would be economical in the whole area with such short experienced life. The same conclusion applies in a soil type averaging 5.2 pH where one service lasted 15 years while in the same area and soil type another service lasted only 3 years the soil in the latter trench having a pH of 3.2 average and 4.5 maximum. While a greater number of tests will produce a better average the above illustrations are included to support the general conclusion that where a few instances are found in a single soil type of pH values representing extreme corrosion, the highest safety factor is secured by assuming all of the soil type in the area to be corrosive and protection based on the maximum corrosive value found.

Even though variations of considerable magnitude occur in the correlation of soil factors and total life, soil survey methods remain adaptable to economic studies as the costs resulting from repairs and replacements between the time of initial failures and replacement of all the structures in an area may be reasonably estimated and provide a valuable guide to the budgeting of operating expenses and investments.

Rogers[1] contends that in pH range of approximately 4.0 to 10.0 the hydrogen ion concentration has little or no effect on the corrosion rate in the absence of oxygen but much in the presence of oxygen unless salts are present which have the ability to reduce the oxygen supply to the metal.

Soils are more frequently found stratified than of single characteristic. Every combination of acidity may be encountered. Where soils in general were found with the surface strata of greatest acidity instances of the reverse condition were not uncommon and in some cases the second strata had the maximum pH value. Instances were found of top layer variations of 400% but lesser variations may be expected as the sample depth is increased.

The acidity of underlying strata can not be predicted by the acidity of upper layers.

While soil of the same type may have color changes in the various horizons there appears to be but little relationship between the color and acid intensity. However color should always be included as part of a survey to assist in soil type designation being the most impressive factor in a visible inspection.

Given the acidity of a soil in general the type can not be designated and conversely given a particular soil type in general the acidity or even limits of acidity could not be assigned. In a few territories close correlation between acidity and type has been found for a restricted number of soils types and may be utilized to advantage to minimize surveys. No one type of soil is most acid although exceptions are found in limited areas.

These facts indicate the limitations of soil maps made by the U. S. Bureau of Agriculture. The maps are valuable in assisting to select and bound types but have no direct value in determining the soil corrosive characteristics.

The uniformity of acidity values over a period of years is at present an open question. Such natural phenomena as seasonal changes, moisture variations, temperature differences, rate of bacterial growth, etc. are known to have an affect. The affect of moisture on the acidity of a soil is susceptible of laboratory analysis and therefore accuracy in prediction is possible. The same method of approach may be pursued to determine the affect of temperature, the general tendency being for acidity to increase with a rise in temperature.

The affect of moisture is reflected in I. A. Denison's contention that acidity determinations are more of a criteria in areas having an annual rainfall in excess of 30". In such areas the prevailing soil reaction is acid any salts being washed out or diluted so as to have practically no effect. A comparatively heavy rainfall also results in a greater average percentage of moisture content.

Well drained soils have usually produced a poor correlation between acidity and corrosion. On the average the acidity of these soils would indicate a high degree of corrosion but the actual deterioration is low.

The seasonal affects have been determined by experiments of Baver[3]. From May to September acid soils gradually increased in pH value, some having an increase of 0.9 whereas alkaline soils showed no definite trend although increase of 0.6 were recorded.

Predicting the corrosivity of soils in city conditions is more difficult than in more or less virgin soils due to artificial changes which will be more fully outlined later.

Obtaining experience in a territory where historical records are available is desirable before attempting to predice the corrosiveness of soils in areas to be served by new additions to a system. More extensive and intensive data is usually collected in a territory having historical records thus developing keenness of observation which is valuable in recognizing specific adverse conditions in a new territory.

While recognizing that there may be conflicting opinions regarding the effect of various soil factors affecting corrosion a soil survey of a new territory has the decided advantage of tangible data to support opinion.

As a safety factor the figure representing the greatest intensity of corrosion found in any layer or at any one point in a soil type to be disturbed during installation of a metal structure is usually assumed as average. Safety is to be considered as an important factor and is enhanced by a conservative estimate of soil corrosiveness.

Recent revision of Snyder's[4] original method for pH determina-

(Continued on page 82)

2. I. R. Baylis, "Prevention of Corrosion Red Water," Journal American Water Works Association, June, 1926.
3. "Factors Affecting the Hydrogen-ion Concentration of Soils," Baver, Soil Science, 1927—23: 399.

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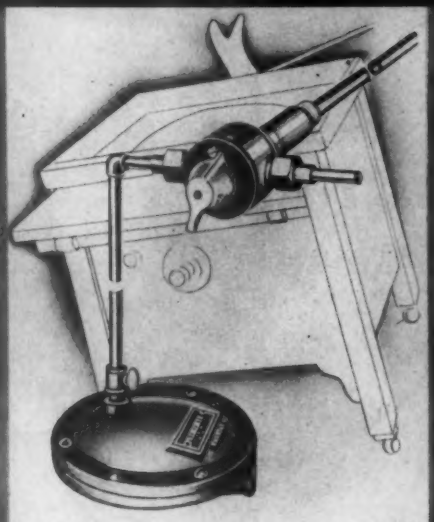
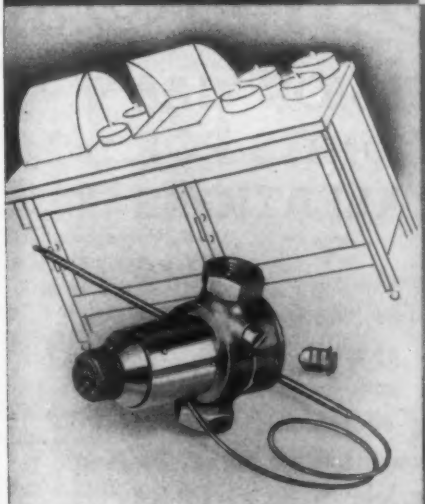


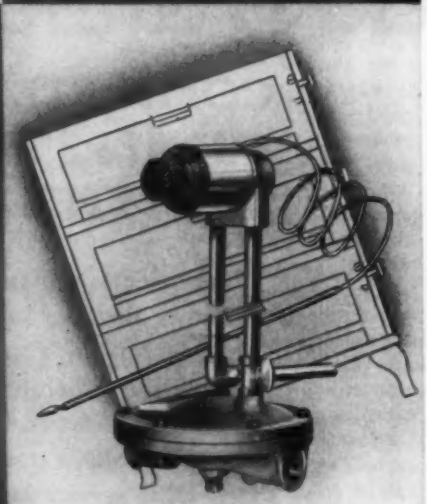
ON DEEP FAT FRYERS

ON DISH WASHERS



ON STEAM TABLES

ON GAS RANGES



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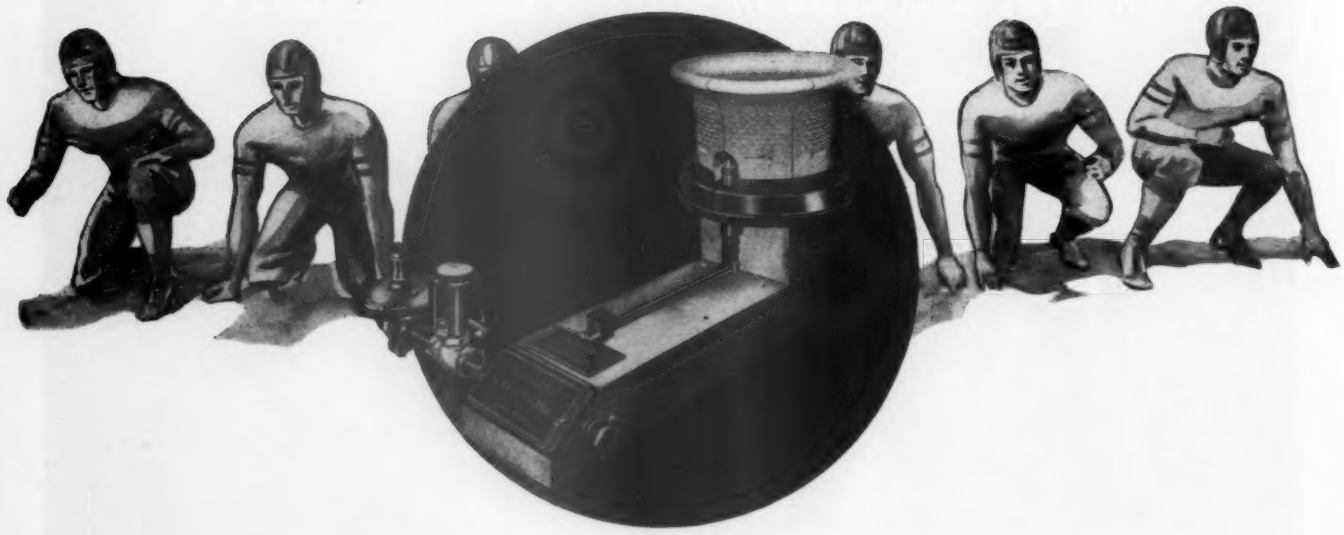

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Pressure Regulation in the Transmission and Distribution of Gas

Part II

by

Allen D. MacLean

Chief Engineer
Pittsburgh Equitable Meter Company

(Continued from October issue)

THE condition of the valves, their ability to be moved freely in response to diaphragm movement, their ability to effect a complete shut-off of the gas when called upon to do so, their ability to pass gas in sufficient volume when required, are the chief functions to watch. By inspecting the chart from a gauge located near a regulator outlet, a jumpy or sharp break in the record can usually be ascribed to sticky regulators, probably either the valve or diaphragm stem.

Increases in pressure over a period of time when the volume requirements are known to be low, especially a gradual increase, if occurring in a chart from near the regulator outlet, indicate that the valves are not closing. If valves or valve seats are worn, imbedded with dirt or particles, not evenly adjusted in the case of balanced valves, this condition will occur.

A pronounced lowering of pressure during the peak hour in a chart taken from near the regulator outlet, indicates that the regulator capacity is too small, or the regulator for some reason is not opening to its full valve travel. Falling off of the inlet pressure to the regulator, forcing the valves to open wide to pass the required volume, will cause dips in the outlet curve at times of maximum load.

If the chart line is broad, this course indicates a regulator which is pulsating.

The usual inspection of charts should be supplemented by a routine of inspection of the regulator itself. It is almost standard practice to provide regulators with a by-pass line and valve, so that the regulator can be taken down and given a complete inspection without interfering with the supply of gas. The bypass valve can be manually operated to maintain a constant outlet pressure during the period the regulator is being repaired. The period of regulator inspection will vary considerably with the local conditions such as temperature, kind of gas, load, etc., and can only be set after a period of observation. Many systems require periodic inspection but once a year, while others, due to dirt or chemical conditions in the gas, must be inspected and repaired on a more frequent schedule.

Inspection Routine

In the actual routine inspection, valves and valve seats offer themselves as the first point to be looked at. In high pressure regulators hard seat valves may be worn, or encrusted with dirt. Many high pressure regulators are built so that by manipulating the lever system the valves can be forced to their closed position. If the inlet valve is just cracked while the regulator valves are being forced closed, large leaks can be immediately detected. If leaks are found they may be eliminated in some cases by merely adjusting one of the valves along the stem to secure simultaneous closing of the two valves. If leaking still persists it will be necessary to remove the valves for cleaning and, if necessary, for remachining or grinding. Hard valves can be "ground in" in much the same manner and with the same type of compound as automobile engine valves. They should be made as tight as possible before being placed in service. Valve guides should be inspected also, as well as valve stems, etc.

In the case of soft seat valves, after the correct adjustment of both valves on their seats is assured, dirt deposits and mechanical weakening of valve material must be looked for. When rubber or some of its substitutes are used for soft valves, in time they become flabby, worn, and too soft. They should be changed before this condition occurs. Also continued deposits of dirt will render a soft valve incapable of closing in properly. At this point we might mention regulators or valves which are so greatly oversize that during most of their operation the valves are near to the seats and subject to a large amount of abrasion. This extreme wear can be prevented by putting in valves of smaller diameter, so that to pass the required volume the valve must move to a position further from the seat and in this way avoid the extreme wearing effects or "wire drawing" experienced when the valves are very near to the seats.

Next in importance to the valves is the diaphragm. In the average regulator installation, the diaphragm is subjected to the outlet pressure on one side and atmospheric pressure on the other. (The exception to this is pilot loading.) The material used in the diaphragm, therefore, must be of sufficient strength to withstand this controlled pressure, and also be flexible enough to respond to pressure changes in the controlled pressure line. With low pressure regulators—those controlling at less than three pounds—it is possible to use leather or sheepskin diaphragms treated with oil similar to meter diaphragm oil; at higher pressures, however, about the only material which meets the requirements physically is rubber sheeting with duck inserts. Any rubber material is subject to deterioration with age and sometimes chemical deterioration in certain gases. The regulator inspection period should provide for a regular change in the diaphragm at intervals dictated by experience. Two year periods are used in many cases for changing rubber diaphragms, yet in some instances more frequent renewals are made.

For the low pressure regulators using sheepskin or calfskin dia-

phragms, a much longer period of life can be expected. At intervals the diaphragm should be soaked for a period of a few hours in oil (prferably meter diaphragm oil). This should insure satisfactory and trouble-free service over a long period of years.

In the mechanical operation of a regulator, links, pins, stuffing boxes, etc., must be considered. Binding must be avoided, and adequate lubrication of all moving parts provided for. In general, the movements encountered in pressure regulation are small; and if stuffing boxes, when present, are maintained free yet gas tight, no difficulty from mechanical movements need be anticipated.

In regulator repair work there is one point which needs some attention. In almost every design there is a possibility to vary the diaphragm positions on the diaphragm stem with respect to the valve position. In reassembling regulators this relation should be so as to give the best performance. If the valve stroke is known, the diaphragm should be set on its stem so as to be one-half of its stroke above the clamping flanges, when the valve is closed. Even movement of the diaphragm without binding is then obtained between the wide open and the completely closed position of the valves.

Leakage of the diaphragm stem where it passes through the diaphragm material should be avoided by exercising care in reassembling the regulator. Clamping nuts should be drawn tight, and, if necessary, soft gaskets provided at each side of the diaphragm.

Another point requiring attention in regulation is the breather line. On that side of the diaphragm not subjected to the control pressure, there must be maintained free access to atmospheric pressure. As the diaphragm moves, the air moves in and out in this compartment. To prevent pulsation it is sometimes necessary to restrict or dampen this movement of air, in that quick movements of air, resulting from pulsation, are prevented. However, it is absolutely necessary to maintain communication with atmospheric pressure, even though restricted, and in the periodic inspection this point should be included.

Pulsations, whenever present in regulator work, are troublesome. If charts show this condition to exist there are several remedies to try, and usually one of them will eliminate the trouble. First, the valve stem travel should be noted; if during the time of pulsation, the valve is very near to the valve seat the trouble can be prevented by using a valve of smaller diameter, or a smaller regulator, so that to pass the required volume the valve must lift to a point further from the seat, which is not so critical. Second, the control line which leads the pressure into the diaphragm chamber can be strictured so as to prevent quick surges of pressure reaching the diaphragm, but allowing slow, even movement to get by. Third, the point at which the pressure tap is taken can be moved to a point more distant from the regulator; this oftentimes tends to eliminate the immediate effect of quick surges and does not get to the diaphragm. Fourth, increased constriction of the air breather line tends to dampen movement of the diaphragm and eliminate pulsation.

In our analysis of regulator trouble from charts, we have assumed that the gauge is located at the immediate outlet of the regulator. Gauges located at some distance from the outlet reflect,—in addition to pressure variations which might be traced to the regulator,—pipe line pressure losses from the regulator to the chart location, which vary with the volume being passed. Any serious dip in the pressure line at this location, of course, needs more than regulator attention, will probably involve rearrangement of regulator locations, additional regulators, additional main capacity, higher set pressure of the regulator, or some sort of automatic loading device to increase pressure at the regulator during high load hours.

Proper Selection of Regulator

An important point in initial design of transmission and distribution systems is the selection of regulator size. The regulator, of course, must be selected with sufficient capacity for any ultimate need. However, it is often times the case that the initial load on the system may be but a very small portion of that load for which the system is designed. This fact must be recognized in selecting the regulation equipment and either a design provided in which the valves can be changed in size as the load grows or arrangements made to put in larger regulators with the increase in load.

From a study of the required accuracy the type of loading, weight, lever and weight, pilot control, or pilot loading can be determined. Extremely accurate pressure control will require a pilot loading type or a pilot controlling type in the high pressure designs. Where such extreme accuracy is not required, the lever and weight type would probably be used. It is well to remember in applying lever and weight type regulators that there is a change in outlet pressure with volume inherent in this design, so that as the rate of flow increases, the controlled outlet pressure will tend to decrease. This fact must be recognized and allowed for in selecting the pressure range for the outlet setting. With the pilot controlling and pilot loading types this tendency of the outlet pressure to decrease with increasing load is practically negligible.

The actual capacity of the regulator is merely a function of valve size and valve lift. In other words, when the regulator is called upon to pass its maximum volume, the valves will open and disclose an orifice of the proper size to discharge this volume under the existing inlet and outlet pressure conditions. It is obvious then that the capacity of the regulator is the orifice ability of these valves at their maximum opening. There is no minimum limit on the capacity of the regulator for if the valves are ground properly and the regulator operates properly it will control pressures from the maximum as determined by the maximum orifice openings of the valves down to the minimum, which, in the case of soft valves or carefully ground hard valves can be practically zero volume. The only important fact then in determining regulator capacity is the actual orifice ability of the valves in their open position. It is found experimentally that there is no very great increase in capacity in opening the ordinary round type valve much beyond one-quarter of its diameter. From this point on the limiting factor is not the cylindrical orifice disclosed as the valve moves toward its open position but the area of the seat circle. This, of course, is not increased as the valve stroke increases. Under this condition of maximum effective valve opening the well known flow formula on the flow through orifices applies and is expressed as follows:

$$Q = K_H \sqrt{P_o h}$$

where

Q = number of cubic feet per hour at a base pressure of 4 ounces

P_o = absolute outlet pressure in pounds per square inch

h = drop in pressure across the regulator in pounds per square inch

K_H = a constant depending on the size of the regulator valve openings and is determined experimentally for each size.

The preceding formula applies below the critical or acoustic velocity of the gas, and is used in computing the table of capacities in that range.

If the ratio of the outlet pressure absolute to the inlet pressure absolute is less than .528, the gas has reached its maximum velocity and cannot be made to move any faster, and what is termed the critical velocity of the gas is reached. Although the gas cannot be made to move at a greater velocity, the actual weight of gas moving can be increased by increasing the density of the gas as it passes through the minimum restriction. Density depends directly on the absolute pressure of the gas, and therefore the actual weight of gas (moving through the minimum restriction) which later expands to the outlet pressure, determines the final outlet volume. In other words, above the critical velocity the volume ability of the regulator is directly proportional to the absolute pressure.

$P_0 = .528\ P_1$ or $P_1 = 1.894\ P_0$

where

P_0 = absolute outlet pressure and

P_1 = absolute inlet pressure,

then

$$Q = K_H \sqrt{P_0\ (P_1 - P_0)} = K_H \sqrt{P_0\ 1.894\ P_0 - P_0} = K_H \sqrt{.894\ P_0^2} = .947\ K_H P_0$$

Now if the inlet pressure is increased above 1.894 P_0, the actual volume of gas passed is proportional to the ratio of the absolute inlet P_1 to the absolute inlet pressure at the point of critical velocity. Thus Q above the critical range becomes

$$.947\ K_H P_0 \times \frac{P_1}{1.894\ P_0} = \frac{.947}{1.894} K_H P_1 = .5\ K_H P_1$$

It will be seen then that there are really two formulas for the capacity of the high pressure regulator: one to be used when the drop in pressure across the regulator is such that the critical velocity of the gas has not been reached, and another to be used for those cases when the drop in pressure is enough to cause the gas to flow at its critical velocity. Critical velocity is reached when $P_0 = .528\ P_1$.

When P_0 is greater than $.528_1$ the formula to use is $Q = K_H \sqrt{P_0\ h}$, which gives the volume in cubic feet per hour at 4 ounce pressure base.

When P_0 is less than $.528\ P_1$ the formula to use is $Q = .5\ K_H\ P_1 = K_{CH}\ P_1$ which gives the volume in cubic feet per hour at 4 ounce pressure base.

The table below gives typical valve diameters, valve lifts, and the required constants to use in the above formula.

Regulator Size	Valve Diam.	Valve Lift	Orifice Area	K_H = Constant below critical velocity	$K_{CH} = .5\ K_H$ = Constant above critical velocity
*	3/4	3/16	.885	430	215
*	1	1/4	1.57	1,400	700
2	1 1/2	1/4	2.36	2,340	1,170
3	2	3/8	4.71	4,330	2,165
4	2 3/8	1/2	7.45	7,500	3,750
6	3 1/2	3/4	16.50	16,500	8,250
8	5	7/8	27.50	27,500	13,750
10	5 3/4	1 1/8	40.70	42,400	21,200
12	7	1 3/8	60.60	60,600	30,300

* Reduced valve sizes for 2" regulator bowl.

For low pressure regulators and district governors, since the outlet pressure is usually near to atmospheric pressure, the formulas can be simplified. For those installations where the inlet pressure is less than 13½ pounds per square inch gauge pressure, the formula for "below critical velocity" applies and is

$$Q = K_L \sqrt{h}$$

where

Q is the rate of flow in cubic feet per hour, at close to atmospheric pressure base,

h is the drop of pressure across the regulator in pounds, and

K_L is the constant given in the table below.

For inlet pressure above 13½ pounds per square inch gauge the "above critical velocity" formula obtains and is

$$Q = K_C\ P_I$$

where

Q = rate of flow in cubic feet per hour, at close to atmospheric pressure base

P_I = absolute inlet pressure, and

K_C is given in the table below.

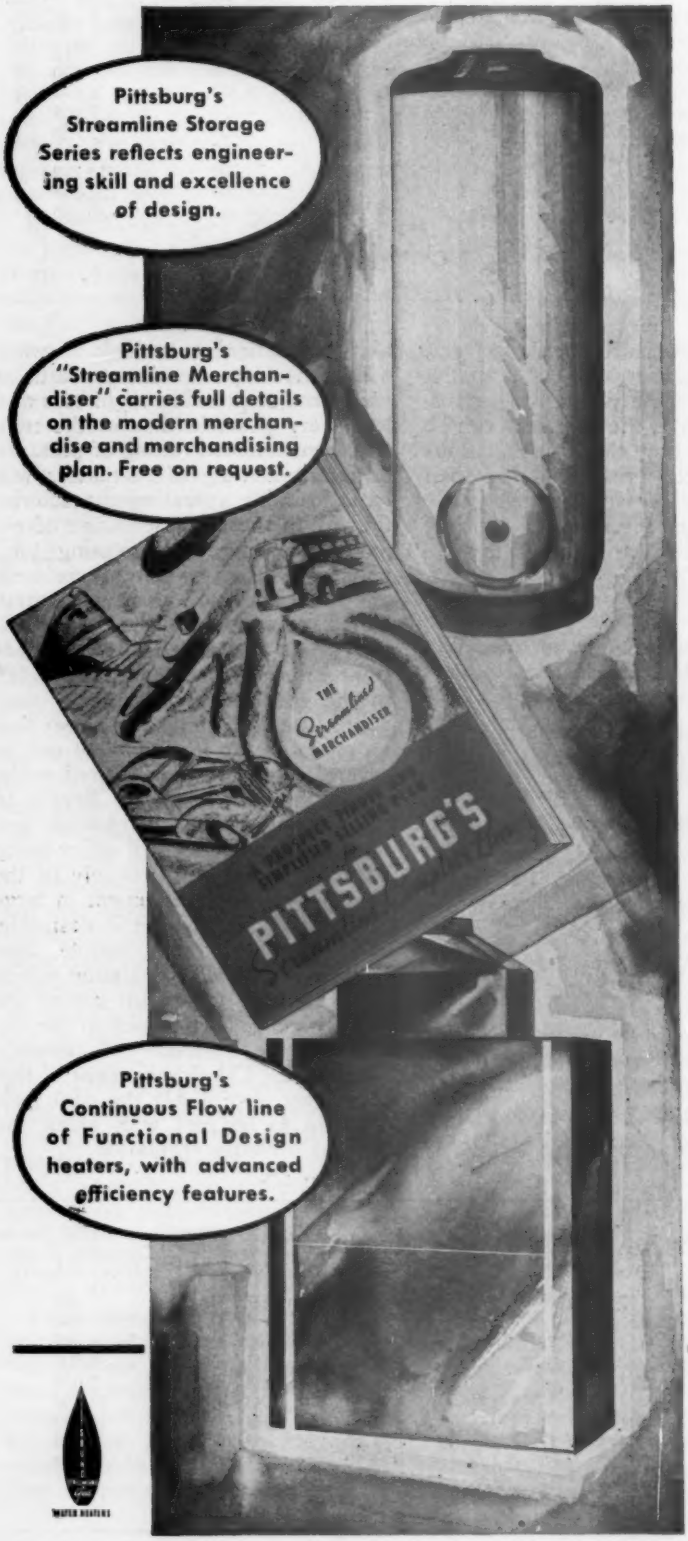
In the foregoing description we have gone over existing applications of large regulators to transmission and distribution work, covering in a general way size selection, operating characteristics, and servicing. It is always interesting to look forward to new developments in apparatus as important as pressure regulators and it is very possible that in the near future remote controlling of pressure or remote setting of regulators will be a desirable operating characteristic. With the increase in use of remote recording gauges using telephone lines, control using these same telephone lines will be a logical step. This can be accomplished automatically so as to maintain pressure constant at some point and connected to the regulator by means of telephone lines or can be used so that an operator can manually set one or several regulators for desired outlet pressures over telephone lines. In very heavily loaded distribution systems this type of control offers many advantages and will probably be the next important development in large pressure regulators. It is desirable, of course, that this remote controlling be applied to existing equipment and will make full use of the knowledge already gained in the design and performance of pressure regulators. The development of this equipment is probably the next logical step to be met with along the lines of pressure regulation.

Regulator Size	Valve Diam.	Valve Lift	Orifice Area	K_L = Constant below critical velocity	$K_C = .1305\ K_L$ = Constant above critical velocity
*	7/8	1/4	1.38	2,150	260
*	1	1/4	1.60	4,000	470
2	1 1/2	3/8	3.54	10,000	1,305
3	2 1/4	9/16	7.95	23,000	3,000
4	2 7/8	23/32	13.00	38,700	5,050
6	4 1/4	1 1/16	29.60	88,500	11,550
8	5 1/2	1 3/8	47.60	149,000	19,450
10	7 1/4	1 13/16	87.40	247,000	32,200
12	8 1/2	2 1/8	113.70	347,000	45,200

* Reduced valve sizes for 2" regulator bowl.

Automatic Gas Water Heating History Will Call 1937

"THE BIG PITTSBURG YEAR"


Pittsburg's Streamline Storage Series reflects engineering skill and excellence of design.
Pittsburg's "Streamline Merchandiser" carries full details on the modern merchandise and merchandising plan. Free on request.
Pittsburg's Continuous Flow line of Functional Design heaters, with advanced efficiency features.
THE Streamlined MERCHANDISER
PITTSBURG'S

And Pittsburg has arranged for you to get your share of the business from the vast 1937 market, with the Streamline, Complete Line and a "Streamlined Merchandising Plan" that doubles, even triples, SALES VOLUME

●

Ready and waiting in 1937 is the greatest market for automatic gas water heating service there has ever been.

It is a market requiring individualized, high quality, adequate and economical hot water service and deserving of adroit, sensible and simplified merchandising effort.

For this alert, modern market, Pittsburg has developed a Streamline, Complete Line of water heaters to meet every conceivable consumer requirement for Gallons of Hot Water Per Day with "custom-tailored" exactness.

To introduce and win acceptance for this "a-year-ahead-of-the-times" line of high efficiency heaters, Pittsburg has developed a "Streamlined Merchandising Plan" that cuts down sales resistance.

Using this plan and the known factors of Gallons Per Day Required and Hours of Usage, you are enabled to specify the type of heater to give the equivalent of "made-to-order" service for the individual job. While arriving at this you will have automatically demonstrated the good "showmanship" that determines the customer to have the heater you recommend.

But get the complete story. Pittsburg's "Streamlined Merchandiser" carries full information on the product, the plan and the sales helps. Write, wire or phone for your free copy. It will be posted at once . . . air mail, special, if you are in a hurry.

●

CAUTION: Whatever the pressure or circumstance, do not commit yourself for 1937 until you have all the "dope" from Pittsburg.

THE PITTSBURG WATER HEATER CORPORATION
PITTSBURGH • PENNSYLVANIA

Dramatizing Gas

By

Carl B. Wyckoff

Public Service Company,
Denver, Colo.

GAS, as gas men know only too well, has always had its light hidden under a bushel as it has never been considered a newsworthy subject. It is far too prosaic, always having been related to a black dirty pipe in the basement and taken for granted in tremendous service that it renders the public. Very comparable to the postage stamp but who ever heard of the latter being eulogized. Electricity on the other hand, is sold surrounded by a highly dramatized, Steinmetz, Edison, Franklin Kite, The House of Magic, etc., etc., all front page stuff, overflowing with romance, glamour and appeal to the public mind.

The inception of the GAS HOSPITALITY HOUSE promotion activity of the Public Service Co. of Denver, Colo., is with the thought of changing this passive acceptance of gas service to one of keen interest. After all why should not gas service be favorably discussed over the bridge table, etc., as well as other topics? While the idea is certainly not new to the industry and The Public Service Company does not feel that they have attained perfection, still they feel that they are making progress along a much needed line.

With many combination companies the gas end of the business is perhaps too commonly taken for granted and frequently pushed to the background in their endeavor to electrify the world. This is a fallacy for many reasons. The investment has been made to supply gas service—a service that has no equal in the fuel field. Gas is here to stay and the sooner this fact is accepted the better. It is the ideal medium for heat generation and the combination company that promotes the widest acceptance of gas as the *preferred* fuel, best serves the interest of both the customer and the company.

In many gas companies it is often felt that gas range selling is not justified. Many feel that they have the cooking business all sewed up in a bag and that it is uneconomical to expend much effort in replacing equipment where there is no apparent revenue increase.

Such a policy overlooks the fact that cooking is the only direct contact gas service has to the home and as such must be maintained on the highest possible level of modern performance if a sound base is to be laid upon which to build a customer interest in and desire for expansion of gas service; and that the cooking load, because of the block type rate, is essential as a means of keeping water heating and space heating service within reasonable competitive limits.

The Public Service Company believes that an extensive program to sell, not just a gas range merely as a piece of furniture or kitchen decoration, but to sell gas cookery through modern appliances as the highest attainable standard of cooking performance is essential to a sound fuel promotion program. For this reason GAS HOSPITALITY HOUSE, though directly engaging in the promotion of other gas services, will lay the approach of its promotion program to the public on the performance of gas fuel in modern ranges of the better type. Ranges that due to age or construction fail to provide truly modern cooking performance will be deliberately outmoded and no thought will be made to undertake a home service type of

activity that "nurses" inadequate equipment. The objectives of the "GAS HOSPITALITY HOUSE" are solely of a creative sales promotional nature designed to sell the superiority of gas fuel and the necessity of modern appliances for complete and modern gas service.

Briefly described the "GAS HOSPITALITY HOUSE" is a large assembly room with a seating capacity that will accommodate one hundred guests and of course modern to the Nth degree. The stage is furnished as an all-gas modern kitchen complete in every detail. The gas furnace and air conditioning equipment is along one side of the room in full view and demonstrates the fact that as far as cleanliness is concerned the basement, kitchen and parlor may be successfully combined where modern gas equipment is used.

From 2:00 to 3:30 p.m. each day there is a three part program. First a musical introduction and gas service demonstration, second a fifteen minute broadcast on home economics and gas service and third a one hour cookery demonstration of recipes and menus given during the broadcast. There are also other short interesting promotional talks.

Main lobby and entrance to Gas Hospitality House—note air conditioning equipment in foreground.

For example, to dramatize the cleanliness and economy of gas as a fuel a glass gas holder has been built and connected to a modern range burner over which is placed a pyrex dish of potatoes containing a minimum quantity of water. The demonstrator points out the absolute cleanliness of gas—so clear it cannot be seen in the glass holder; explains that the cost of this two cubic feet at a $1.00 per M.C.F. rate is exactly one-fifth of a cent or the value of one Colorado sales tax token; describes the advantages of controlability of gas fuel in modern cooking performance; lights the burner and requests the audience to hand in their estimate of the length of time that this sales tax token's worth of gas will continue the cooking operation. At the close of the program when it is shown that at the rate of $1.00 per M.C.F. this one-fifth of a cent's worth of gas boiled the potatoes for fifty minutes, the economy of gas fuel is dramatically established and the economical use of gas for househeating or automatic water heating at much lower rates becomes an immediate and attainable possibility for the average customer.

From 9:00 a.m. to 1:30 p.m. and from 3:45 to 5:00 p.m., GAS HOSPITALITY HOUSE is open for inspection and individual consultation or gas services and related problems.

As a department interested in the broad creation of an active public demand for gas service rather than the specific sale of any one line of appliances, GAS HOSPITALITY HOUSE will also handle the dealer co-operative activities of the company.

Adequate and intelligent dealer participation in the distribution of gas appliances will be sought as a logical step in developing public preference for gas and as a necessary representation to compete with the wide spread multiple outlets of all other appliances consuming competitive fuels. Active dealer participation, however, will be established on the basis of market possibilities in gas appliance merchandising and not on a utility subsidy.

The following general policies will be adhered to in the fostering of dealer participation in the gas appliance field:

1. Utility obligation and necessity to create public demand for gas service.

2. Utility obligation and necessity to retain and protect its business by continuing direct and aggressive merchandising activities of gas consuming appliances since the utility is the only party totally dependent on the sale of gas appliances as opposed to a competitive fuel appliance.

3. Utility obligation to so conduct its aggressive merchandising that an alert dealer can compete at a net profit in appliance sales. This does not mean that the weak dealer can or should be guaranteed a profit.

4. Dealer obligation to conduct his own actual selling and to accept without subsidy the responsibilities that attach to merchandising of gas appliances or any other commodity. The dealer as an independent business man is entitled to be recognized as such and must not be subjected to utility regimentation or over doses of utility paternalism.

5. The utility should make available assistance in training dealers, their salesmen and workmen in merchandising technique.

6. The utility shall not in any form subsidize dealer operation. Such subsidies in the final analysis are paid at the expense of sound market development activities.

Our director, Claire G. Henderson, is available at all times for consultation with dealers and attendance at their organization meetings.

There is a tremenndous potentiality existing in journeymen plumbers and it is hoped that this activity will help to capitalize this latent power. When the gas salesman contacts the customer, it is usually a routine canvass call, unexpected, unsolicited and commonly undesired, or at the least, inopportune. The reverse condition exists with the plumber. He has been called to the house for a definite reason, is expected and usually anxiously awaited. However, he has always been trained that he is selling a service only and he has not been inoculated with the idea of replacing equipment, and thus creating a larger profit through a sale, besides improving the customer's service. It

(Continued from page 86)

Thanks 1,000,000

More Than a Million Minneapolis-Honeywell Gas Controls Now in Service — Some as Long as 25 Years

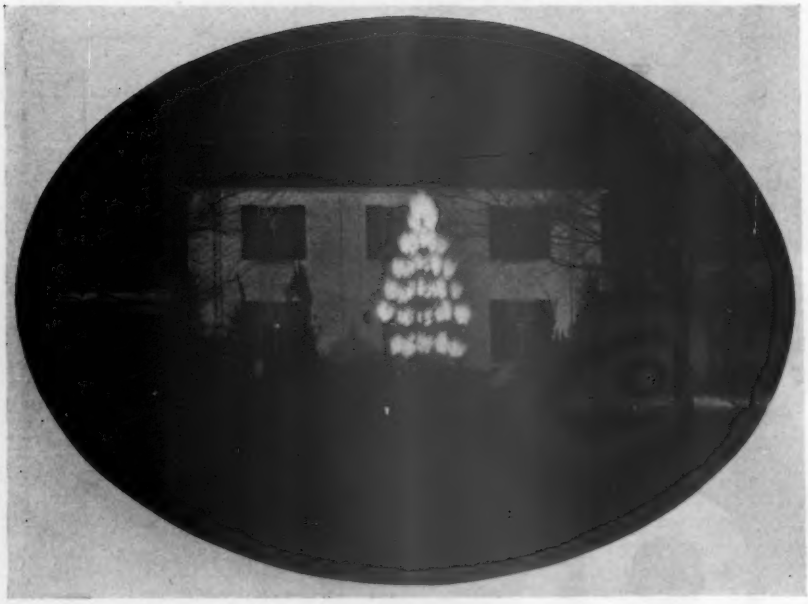
THE first Minneapolis-Honeywell gas heating controls were installed more than 25 years ago. Today, upwards of a million Minneapolis-Honeywell gas controls are in active daily use, some having seen constant and dependable service during that period. Such a performance record bespeaks the quality and dependability of Minneapolis-Honeywell controls. Their widespread adoption by the gas heating industry can be directly attributed to the years of laboratory and field research behind each control, permitting such contributions to the automatic heating industry as the Acratherm, which uses the heat acceleration principle. Three years of active use without change in design or principle, have proved the soundness of the Acratherm. More than 50 years of dependable service have proved the soundness of Minneapolis-Honeywell engineering and research. Minneapolis-Honeywell Regulator Co., 408 East 28th St., Minneapolis, Minn. Branch and distributing offices everywhere.

Dependable Controls Cost Less Than Service

MINNEAPOLIS-HONEYWELL

Control Systems

BROWN INDUSTRIAL INSTRUMENTS FOR INDICATING, RECORDING, AND CONTROLLING



A Blazing Christmas Tree

—"Yet the fires consumed it not"—

By Elsie Van Horn

A UNIQUE manifestation of the emblem of yuletide, believed to be the first natural gas Christmas Tree ever constructed, adorned the lawn of Mr. George Frederickson, 1604 Camden Way, Oklahoma City, Oklahoma, and burned each evening during the 1935 Christmas season. Hundreds of persons were attracted to this demonstration of potential artistic qualities in natural gas, a product heretofore considered strictly utilitarian.

The idea for this remarkable exhibit was conceived by Mr. Frederickson himself. He is vice-president of the Oklahoma Natural Gas Company. Details of construction were worked out by T. A. Wood, Superintendent of the company's Oklahoma City district.

The "tree" was approximately 14 feet high and almost eight feet across at the widest point. The "trunk" was made of two-inch gas pipe extending about half way up, and was topped out with inch-and-a-quarter pipe. "Branches" were of three-fourths-inch pipe on the two-inch part of the trunk, and of half-inch pipe on the inch-and-a-quarter part.

Beginning 18 inches from the ground, branch-groups of four were alternated 12 inches apart all the way up. Branches in the lowest group were each four feet long. Above these was a group of short branches; then, another group of long ones, but not so long as the first ones; and above these, a cluster of short ones again; and so on alternating long and short groups, gradually tapering toward the top.

On top and at the end of each branch were burners—49 in all. For these, caps were threaded on the pipe ends, and a #40-drill was used for the holes. Then, fitted over each burner, acting as mixer and as protection from the wind, were inch-and-a-quarter caps. These caps caused the flame to flare out and around the cap itself. The flames were each six to eight inches long, and if any were blown out by the wind or from other cause, by the arrangement of the branches, it quickly caught again from other flames.

Festooned among the branches of the bare pipe-tree were more than 500 feet of asbestos rope. In the flame, the rope assumed a brushy effect and seemed dancing and alive, shimmering in many colors, with gold predominating. Hung here and there through the tree were 150 various colored balls, stars, pendants, and other of the same type fragile baubles that are used to adorn "inside" Christmas trees. These ornaments glittered and shone in the dancing flame, and came through only smoked up a bit.

The cost was not great, Mr. Frederickson stated, either as to construction or fuel. When burning, the tree used approximately 2500 feet of gas an hour. Gas to feed the tree was piped in from a regular 4-inch main, carrying about 20-pound pressure, which was reduced to 8-ounce and extended over to the tree.

Christmas Window Display of Consolidated Edison Co., N. Y.

"THERE'S NOTHING LIKE RUUD"

for ailing meters

Water heaters are on the "must" schedule for 1937 and RUUD is ready with a line that meets all operating and selling conditions.

Its sales organization is nation-wide,—factories are strategically located,—and advertising is built to meet the needs of the day.

Check with RUUD for 1937 selling!

ONE
WATER HEATER
Won't Fit Them All!

Small, medium and large incomes . . . small, average and large homes . . . natural, mixed, manufactured and liquified petroleum gases . . . hard and acid water . . . one, five, ten and a hundred faucets.

RUUD
PITTSBURGH, PA.

News of the Gas Industry

New Pipe Line to St. Thomas, Ont.

The Dominion Natural Gas Co., now has a large staff of men excavating for the new pipe lines which are being constructed into St. Thomas, Ontario which in the past has been supplied by artificial gas produced in the municipal plant. The question of continuing the city-owned gas plant with its mounting deficits or granting an exclusive franchise to the Dominion Natural Gas Co., was decided recently at the polls. The taxpayers decided almost unanimously to sell the pipe lines and other equipment to the private firm for $152,000, a price which it quoted. C. E. Fallon for the past three years manager of the Dominion Natural Gas Co. office at Tillsonburg, has been promoted and placed in charge of the company's new branch in St. Thomas.

T. W. Halloran with New York Power & Light Corp.

Thomas W. Halloran has been appointed gas sales advisor for the entire New York Power and Light territory. In this capacity, Mr. Halloran will cooperate with all gas districts of the company in promoting the use of gas for industrial, commercial and residential purposes. His headquarters will be in Albany and he will report to R. P. Wagner, commercial manager.

Mr. Halloran has been connected with the New York Power organization since 1929 as supervisor of gas heating and air conditioning sales. The new appointment enlarges the scope of his duties to act in an advisory capacity on all the uses of gas in the industrial, commercial and residential fields.

For five years prior to his coming to Albany, Mr. Halloran was with the Utica Gas and Electric Company, engaged in plant operation and in commercial and industrial applications of gas. Mr. Halloran had a varied engineering and advertising sales experience for a five-year period previous to 1924.

"Jos" Taylor, Sales Manager Pittsburg Water Heater Co.

One event of general interest at the American Gas Association Convention at Atlantic City was the announcement on October 27 of the appointment of J. D. Taylor to be Sales Manager of the Pittsburg Water Heater Corporation, Pittsburgh, Pa.

For the past three years, "Joe" Taylor as he is familiarly known to his hundreds of utility friends, has been Southern Representative for the Edgar Morris Sales Company, Washington, D. C., district of Pittsburg Water Heaters.

The Value of a Company Library to all Employees

"A public utility company makes as broad a demand upon its library as any business in the country," said Harold S. Sutton, executive assistant to the chairman of the board of directors of the Consolidated Edison Co. of N. Y., Inc., speaking before the October meeting of the New York Chapter of Special Libraries Association, held at the company's New York office, 4 Irving Place.

"On the technical side, the library must keep track of current magazine articles having to do with the developments in the electric, gas and steam business. Practically all of the new books on these subjects will be placed on the shelves and we will be furnished with abstracts of their contents.

"The men out in the field must be kept abreast of current developments, and our library also keeps us informed as the actions of the various New York City departments which might affect our property or our customers' requirements for service.

"Law suit testimony may be important to our companies, and rate cases all have a bearing, while social security plans and legislation are matters of the utmost importance."

After declaring that the vital question in every firm or organization possessing a library is "How far should we go in broadening our present scope," Mr. Sutton answered it by saying the Consolidated Edison Co. of N. Y., Inc., is about to experiment in this direction by adding books of general interest on economics, politics and social matters, in addition to keeping the library open one night a week.

Natural Gas At London, Ont.

The Union Gas Co., which is supplying London, Ontario with gas, as the result of a by-law passed at the municipal elections granting it a franchise, is now laying another supply main from its Dawn fields near Sarina to London, paralleling the one recently completed. It will be a ten-inch main and the two are to ensure a good supply of gas for the city and other towns through which the line will run.

Gas Company Changes Corporate Name

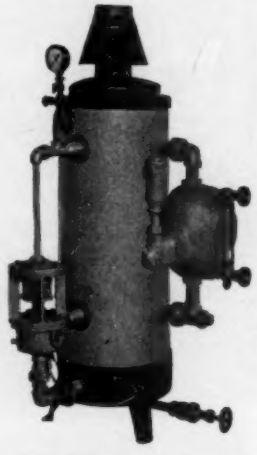
The corporate name of the Alabama Utilities Service Company, Montgomery, Ala., has been changed to the Alabama Gas Company by the filing of an amendment to its certificate of incorporation. The change in name was authorized at a recent meeting of the board of directors in New York City.

The change was ordered by the directors because the new name is more descriptive of the business of the company, W. W. Winter, president, said. He pointed out that the company engages only in the gas business, and the former name carried the implication that the firm was identified with other types of utility operations as well. Maurice White is manager of the company.

The Boulder Dam in Word and Picture

Interesting facts about this huge and noteworthy engineering achievement are presented in a striking picture-story in bulletin form by The Barrett Co. The data given outlines the methods and materials used in the construction of this tremendous project which was completed two years ahead of schedule at an estimated cost of $120,000,000. Numerous photos showing the work in progress are reproduced along with views of the completed structure and buildings. One large aerial view shows the rugged contour of the site of this 726 foot dam forming a lake which will cover 227 square miles, insuring flood protection, irrigation facilities and power rated at four times the H.P. now developed at Niagara Falls. The use of Barrett waterproofing and pipe line enamels on the project are briefly featured. Copies of this bulletin may be had by writing The Barrett Co., 40 Rector St., New York.

INDUSTRIAL GAS BOILERS
Tubular or Flueless
¾ to 45 H.P.



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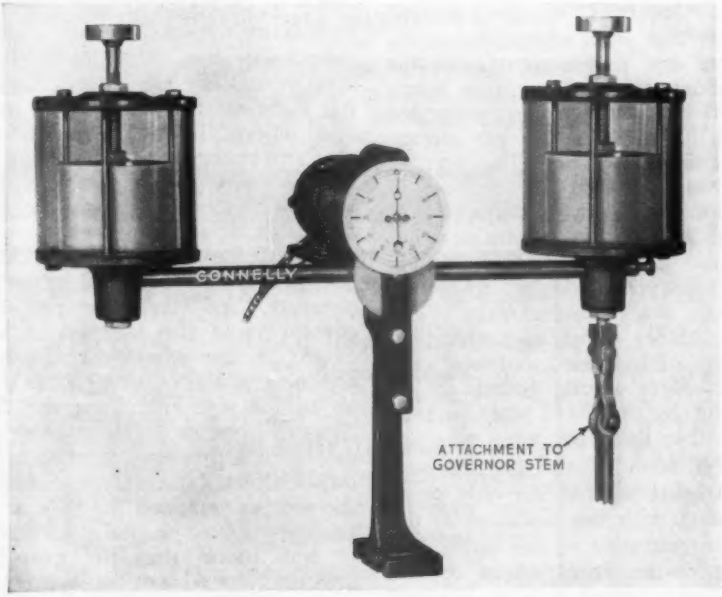

a simple fool-proof substitute for the old style Connelly mercury loader. Can be used on float or diaphragm governors for Station or District use.

Without any complicated or perishable moving parts. Adjustment very flexible to meet local conditions.

Write for Bulletin 200 B-2 for complete information.

Connelly
Iron Sponge & Governor Co.
Chicago, Ill. Elizabeth, N. J.

Increasing the Capacity of a Large Diameter Natural Gas Transmission Line, etc.

(Continued from page 36)

Accordingly, plans were made to put the scraper through the first 2¼ miles of this main line as a test run to determine just how it would perform in a badly fouled line and to develop any modifications which might be necessary for use under such conditions. When this main line was opened up it was found that it contained a considerable amount of fluid and was fouled with a heavy coating of sludge. The coating was slate gray in color and was damp and oily. It had a consistency very much like that of a mixture of sand, grit and butter at ordinary room temperature or somewhat harder, could be smeared down smooth by heavy pressure with the plam of the hand and much of it could be scraped off quite readily. The extreme highest projections were something like ¼" in thickness although the average thickness of the coating was something over ⅛". The bottom of the pipe contained a layer of fluid about ½" deep.

After the scraper had been inserted in the pipe, the control run was coupled into the line behind it and the pressure built up to 6.7" of mercury, when the scraper started moving. Gas was being admitted behind the scraper at that time at a rate of approximately 9,000 M cu. ft., per 24 hours and this rate was gradually increased to approximately 14,000 M cu. ft. per 24 hours by the time the scraper emerged from the end of the 2¼ mile section of line. The propelling pressure increased to 11½" of mercury during this time. The scraper travelled the 2¼ miles of line in 6½ minutes, or at an average velocity of approximately 21 miles per hour.

The gas stream ahead of the scraper carried with it an appreciable cloud of oily fog but, as might be expected from the wet condition of the interior of the line, did not carry any dust. A considerable quantity of slush was found in the bell hole after the scraper emerged. The interior of the pipe at the end where the scraper came out showed evidence of having been recoated with a spray of slush carried in the gas stream behind the scraper, and when the line was given a thorough blowing out after the scraper had emerged, large quantities of slush were blown from it.

The scraper was again put through this same 2¼ miles of line and brought out a comparatively small amount of material and a blow after this rerun failed to bring out any debris of slush. After this blow, which dried out the interior of the line, the interior of the pipe at the open end where it was accessible for inspection was smooth and only lightly coated with a slate-gray dust which could be easily brushed off. It was decided, therefore, that there was no point in running the scraper a third time through this section of line.

The scraper was next run through another section of line 2½ miles long which was traversed at an averaged speed of approximately 27 miles per hour. This second section terminated at a large, specially designed reservoir drip through which the scraper could not pass. When a joint of pipe was taken up immediately downstream or beyond this drip to introduce the scraper in the third section of line for the next run, it was found that the nature of the coating inside of the pipe was quite different than that which had been found upstream from the drip, indicating that this drip was quite efficient in removing the foreign substances from the gas stream. The coat was crystalline in nature and of a purplish brown color. It was dry and adhered firmly to the interior of the pipe so that it could be scraped off with a knife blade only with difficulty. This coating although probably not more than 1/16" in thickness, was very rough and undoubtedly caused a great deal of turbulence in the gas stream. In runs of the scraper through the line where the coating was dry, downstream from the drip above referred to, large quantities of dust and debris were carried out of the pipe in the gas stream ahead of the scraper. The scraper was rerun through one portion of line containing this character of coating in order to determine whether two cleanings were advisable but it was decided that a second cleaning was unnecessary. The scraper blades, which up to this time had been of hardened tool steel with square edges, were found to be worn off by this hard scale in such a way that the front edge was appreciably rounded and the top surface beveled so that the only point of contact with the pipe was at the extreme rear edge of the blade. Accordingly, the front edges of the blades were coated with stellite and the blades were ground to a bevel to give clearance at the rear edge. This modification of the blades proved to be quite effective in removing the hard scale.

The scraper was run through approximately 86 miles of line to a point beyond which the efficiency of the line was reasonably satisfactory. The maximum run made in any one day with the scraper was 21.2 miles when two sections of main line between block gates were cleaned. The only mishap which occurred in the operation of the scraper was when the device hit a joint in the line which it could not pass. This was at a stream crossing where the scraper was stopped by an open joint within a long sleeve at a point where the pipe was offset within the sleeve in making a considerable break of alignment in order to make grade to get below the stream bed. The total time consumed in cleaning the 86 miles of line was only 11 working days and the work was done without interruption of service and with no out-of-pocket expense for labor as it was all handled by regular maintenance forces of the gas company. At the time the scraper was hung in the line at the stream crossing, sufficient gas was passed through it to pack the line ahead of it enough to provide for the load demand during the period required to dig up the line and remove the scraper.

General Comments

Lower velocities of scraper travel than the average of between 20 and 25 miles per hour which was maintained in cleaning out the main line could be realized by admitting gas behind the scraper at a lower rate, but it was found that such lower velocities would not maintain constant motion as the momentum of the scraper at these lower velocities was not sufficient to carry it past minor obstructions. It was, of course, found that any changes in blade-spring tension or in the blades themselves, such as grinding them with clearance at the rear edge or applying wear-resisting alloys to the cutting edges, caused changes in the required propelling pressure, and that the propelling pressure was also affected to some extent by the quantity and relative hardness of the coating on the interior of the pipe line. However, these changes in propelling pressure were not of such proportions as to appreciably affect the average velocity of the scraper provided the volume and pressure were properly controlled. It was found that the propelling pressure should not be appreciably increased after the scraper started, but that the volume rate should be increased after the scraper started,

(Continued on page 78)

CF

FULTON
Cut-Out Latch
Regulator

If Gas Fails the Regulator will close and lock

THERE are no hazards due to failure of gas supply where the Fulton Cut-Out Latch Regulator is installed. Let pressure drop below the set minimum and the latch automatically shuts and locks the valve. Before flow will resume, the operator must open the valve by hand. Users of low-pressure furnaces and burners protect their equipment effectively, at little cost, by adoption of this safeguard. Ask for Bulletin 2987.

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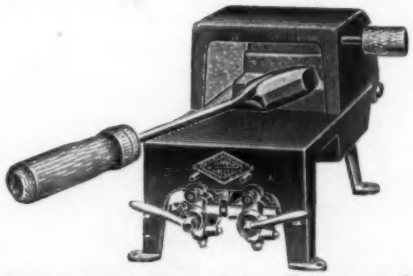

This is the most powerful, efficient and economical Bench Furnace made for heating soldering coppers up to 12 lbs. per pair, heat-treating, tempering, annealing or case-hardening any carbon steel tools or small metal parts. No forced air blast is necessary. Fired by two powerful Johnson Bunsen Burners, each with shut-off valve and pilot light. The Johnson Patented curved shaped hood forces a return blast over the tops of the irons or parts being heated. Sturdily built to withstand hard usage and will give years of excellent service. Write for free catalog.

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Equipped with Improved Patented Locking Sleeve, which locks both handles to the pipe. Stopper cannot slip. Gas cannot pass.

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ARGEST GAS COMPANIES NOW
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SAMPLES AND PRICES
GLADLY SENT

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LAMBERT METER CO.
BUSH TERM. BLDG. 4, BROOKLYN, N. Y.

(Continued from page 76)
in order to supply the displacement volume created by the movement of the scraper. The propelling pressure, as indicated on the manometers at the point where gas was admitted to the line behind the scraper, showed definitely when the scraper was moving and when it had stopped.

Improvement in Pipe Line Efficiency Effected by the Use of the Scraper

The main transmission line through which the scraper was run was constructed in the winter of 1927 and has been in constant service since that time. The deliveries through the line have been of the order of 12,000,000 M cu. ft. per annum computed at a pressure of 16.4 lbs. absolute and a temperature of 60° F.

At the field end of the line there is a compressor and absorption gasoline plant station known as Bivins Station. The line passes near the town of Dalhart, Texas which is 4½ miles from Bivins Station and from Dalhart to a compressor station at Clayton, New Mexico another 43.7 miles; the total distance between Bivins Station and Clayton Station being 86.2 miles. The elevation of the line at Bivins Station is 1,046′ lower than its elevation at Clayton. The line is of 22″ outside diameter pipe, the first 51.6 miles north of Bivins Station being ⅜ inch wall pipe and the remainder of the line to Clayton being 11/32 inch wall pipe. The line is constructed of single random lengths of about 20′ with Dresser couplings. At Bivins Station there is a dust separator in the compressor suction line and a Tracyfier on each side of the gasoline plant.

The line is divided into sections of about 10 miles each by 18″ block gates.

The efficiency of the pipe line had never been calculated with reasonable accuracy until February, 1936, although rough calculations had been made a year or two prior to that time which indicated an efficiency of about 85% for that portion of the line between Bivins Station and Clayton. In February, 1936 accurate calculations were made which showed the efficiency of that stretch of line to be 85.9%. The efficiency of the section from Bivins Station to Dalhart, a distance of 42½ miles, was 76.7%, and of the section from Dalhart to Clayton, a distance of 43.7 miles, was 98.6%. The rate of flow through the line at the time these efficiency tests were made was approximately 80,000 M cu. ft. per day, calculated at 16.4 lbs. and 60° F.

The foregoing efficiencies are expressed as percentages of the calculated normal efficiency for the line, 100% efficiency being that efficiency which would correspond to Weymouth's formula adjusted for the difference in elevation of the two ends of the line and for the rate of flow.

On July 7, 1936 before the scraper was run through the main line an efficiency test of the first 9.85 miles of this line was made, and its efficiency was found to be 66.8%. On July 10, 1936, after the scraper had been put through this portion of the line, the efficiency was found to have been raised to 93.8%.

On July 10, 1936 the next section of the line was tested and found to have an efficiency before running the scraper of 74.9%. This particular section of the line was not individually tested after the scraper had been put through it.

On July 17, 1936, simultaneous pressure readings were taken at Bivins, Dalhart and Clayton, and the overall efficiency of this portion of the line was found to be 101.1% as compared with 85.9% prior to running the scraper. Up to this time the scraper had been run through only the first 42½ miles of the line, from Bivins to Dalhart, and had not been run through that portion of the line from Dalhart to Clayton. Later readings after the scraper had been run all the way to Clayton indicated an overall efficiency of 106.7% for the entire 86 miles from Bivins to Clayton.

The use of the scraper in the Amarillo-Denver natural gas transmission line has demonstrated the ease with which the efficiency of a badly fouled natural gas transmission line can be restored by internal cleaning with a pipe line scraper or go-devil, and although not completely conclusive as to this latter point indicates the possibility of increasing the capacity of a pipe line to a point even beyond the original normal capacity for new pipe. This increased capacity beyond that normal for new pipe is believed to be brought about by the fact that the cutting and abrasive action of the stellited scraper blades leaves the interior of the pipe in a smoother condition than that in which pipe is ordinarily received from the mill.

The design and construction of the scraper used in the Amarillo-Denver line was reasonably satisfactory, as demonstrated by the fact that the scraper effectively accomplished the purpose for which it was designed, that it held up well and required no particular maintenance work except the replacement of re-stelliting of blades as they become worn, and the occasional replacement of the rubberized fabric belting squeegee discs, and by the fact that the device was constructed and operated by the regular forces of the gas company. The detailed supervision given by the writer throughout the work was not really necessary after the first few days of operation, when the procedure had been reduced to a fixed routine.

A.G.A. Laboratories Issue New Bulletin on Domestic Use of Gas and Electricity

In September, the American Gas Association Testing Laboratories at Cleveland published and distributed an attractive 36-page illustrated pamphlet, "Reprints of Articles Covering Use of Gas and Electricity for Domestic Cooking and Heating Purposes." Five semi-technical papers by two of the Laboratories' executives on different phases of the ever-present gas versus electricity issue are reproduced in it. These articles were originally printed in the journals of the industry, and the revision of only one was necessary to bring the subject matter up to date. All discussions are presented in a simple manner, and the abundance of photographs, tables, and charts vividly carry the message to the reader.

Only the first two chapters deal with the economics of using the two forms of energy. All five are based upon impartial and thorough research and study at the Testing Laboratories and at various other institutions. As a whole, the gas industry is familiar with the authoritative Bulletin No. 6, "Investigation of Domestic Cooking by Gas and by Electricity," published last year upon completion of that research project at the Laboratories. The new "Reprints of Articles Covering Use of Gas and Electricity for Domestic Cooking and Heating Purposes" booklet not only presents the salient facts in Bulletin No. 6 in a popular and briefer manner but also contains much additional useful information.

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Highest H_2S removal combined with complete removal of traces. Physical structure insures very low box back pressures.

THE RECOGNIZED PURIFYING MATERIAL FOR VAPOR PHASE GUM CONTROL.

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BARBER BURNERS

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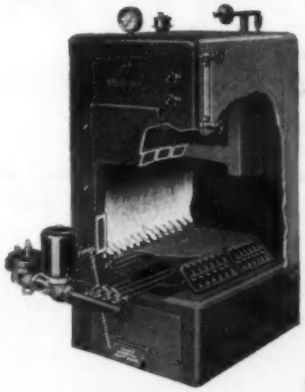

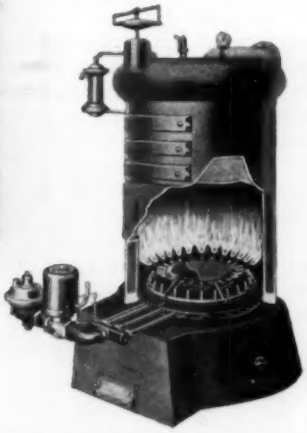

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- Made in 8 different sizes to accommodate round grate diameters from 12" to 34". Also "tailor-made" to SUIT and FIT the grate dimensions of rectangular furnaces or boilers.
- They insure a "scrubbing" flame action against side walls of firebox, at the proper level, with 1900° Fahrenheit flame temperature.
- No fire brick or refractory elements needed to deflect the flame to the side walls. Barber Burners require only 70% of the installation time of average Burners using such elements.
- Equipped with the improved Barber noiseless jets, unequaled for air-mixing efficiency.
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BARBER *Automatic* JET GAS BURNERS

for Warm Air Furnaces, Steam and Hot Water Boilers
And Numerous Other Heating Appliances

Purification Commercial Gases

(Continued from page 54)

In this test, the forms, instead of being placed in a chamber outside the superheater, as in the small scale plant tests just mentioned, were placed in the top of the superheater to save the cost of additional plant equipment. This test was followed by additional tests with coated forms in the Spring Gardens Plant and in the Central Union Plant of the Consolidated Edison Company of New York. These tests indicated the probability of extremely low purification costs per ton of sulfur removed but gave only partial removal of sulfur, the percentage of removal decreasing during the course of the tests.

Report of Gas Production Committee

(Continued from Technical Session)

ALAN E. LOCKWOOD, Chairman

Penn-Western Service Corporation, New York, N. Y.

This included the following contributions and subcommittee reports:

"Coke Strength & Structure As either blended or 100% high volatile coal certain amounts of coke breeze may be disposed of by mixing with Affected by Coke Breeze Admixture to Coal."

The committee is of the opinion that at least with certain kinds of the coal to be carbonized. The addition of this breeze does not produce harmful effects on the coke strength providing the size of the breeze is kept below certain limits. Under the same conditions the size of the coke on the wharf is materially increased.

Summary of A.G.A. Water Gas Committee Reports 1924-1935.

Economics of Oil Refining by the Gas Industry

(Continued from Technical Session)

D. W. WILSON

The M. W. Kellogg Company, New York, N. Y.

This paper may be summarized as follows. First, the mutual interests of the oil and gas industries have been indicated by statistics showing considerable similarity for both in raw materials used, in transportation methods involved, in products made and in uses of the products of the two industries; and, Secondly, consideration has been given to possible production by the gas industry,—in accordance with the methods of the oil refinery,—of gas oil for water gas carburetion. This consideration has involved in all cases the production of 1,000 barrels per day of gas oil and has been based on (a) Mid-Continent crude as charge and atmospheric pressures topping operation, (b) reduced crude as charge and viscosity breaking operation, and (c) reduced crude or a commercial fuel oil as charge and a cooking operation. It has been shown that methods (a) and (b) have inherently many disadvantages and consequently probably are not of real importance. It has been further indicated that method (c) may in certain cases prove basically sound and economic for use by the gas industry.

Necessary Sales Activities for a Healthy Growth of Commercial Gas Sales

(Continued from Industrial Session)

ROY E. WRIGHT

New England Gas and Electric Association, Cambridge, Mass.

A hypothetical restaurant operator is cooking with gas on modern range equipment, but is heating water rather unsatisfactorily, but cheaply, with soft coal. We approach him with the suggestion that he let us prepare an estimate on equipment cost and probable operating cost of heating this water with gas. Now the average restaurant owner has as much idea of his daily hot water requirements as the man in the moon. Consequently before even a preliminary estimate is given this prospect, we immediately install a demand type water meter, and obtain an accurate picture of daily hot water usage, hourly peak demands, and all factors which make this particular load different from any other so-called similar load; and invariably each load *is* "different" from the next one, especially in the water heating field. We may note from careful observation that this customer has a tank which can be used as a "tempering" tank, and enable us to gain a little in efficiency. We may observe that the judicious use of pipe covering will help us; the installation of a few spring type faucets and the repair of leaky faucets, may be turned to our distinct advantage. Thus armed with a complete analysis of the job, and with all the facts at our command, we proceed to make our recommendations intelligently and sell the job. Invariably one selling is sufficient and we are not forced to resell periodically each time the gas bill comes round. Sales resulting from this painstaking, sound engineering attitude, have become so consistent and frequent that we are more than ever convinced that "careful selling" must be one of the prime requisites of any method employed to secure commercial cooking load.

Compendium Committee Report

(Continued from Accounting Session)

C. J. FUE, Chairman

The Brooklyn Union Gas Company, Brooklyn, N. Y.

This report summarizes the activities of the Accounting Section for the years 1934 and 1935, and lists the various addresses, reports and papers prepared by the section during those years.

It completes the compendium to date.

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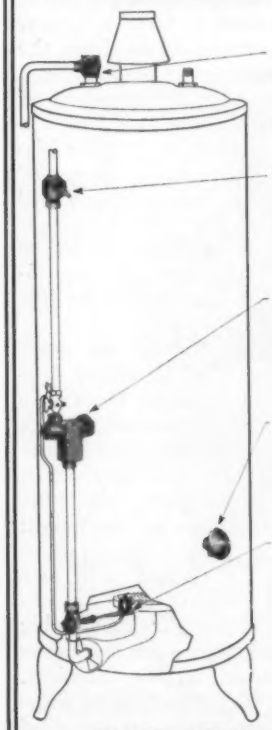

Titan Relief Valve

Prevents excessive pressure and temperature. Pressure relief at 150 pounds, temperature relief at 200° F.

Titan Safetystat

Automatically shuts off all gas to the burner in the event excessive temperatures are developed.

Titan Snap Action Thermostat

Is an extremely sensitive instrument providing perfect control of water temperature. Equipped with a Temperature Selector.

Titan Nu-Drain

Its compact design provides almost complete concealment of the body. It improves the appearance of any heater.

Titan Safety Pilot Control

Automatically prevents escape of unburned gas from main burner in case the constant pilot flame should become extinguished.

Titan Controls are built to meet the rigid requirements of water heater manufacturers. Catalog and full details on request.

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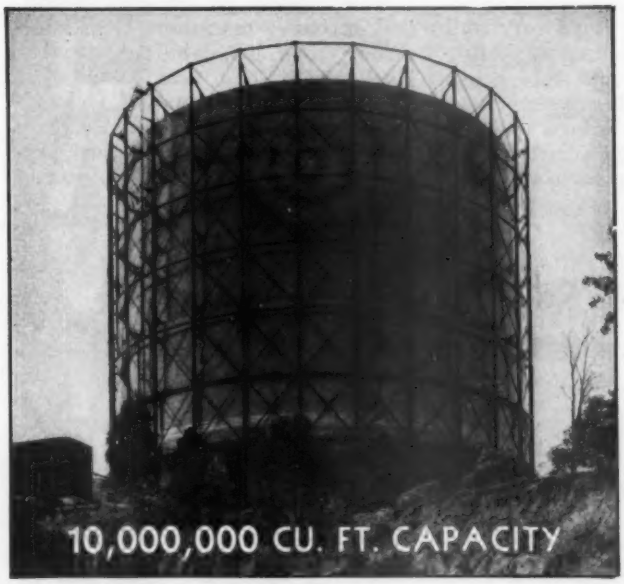

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Winter AIR CONDITIONING System

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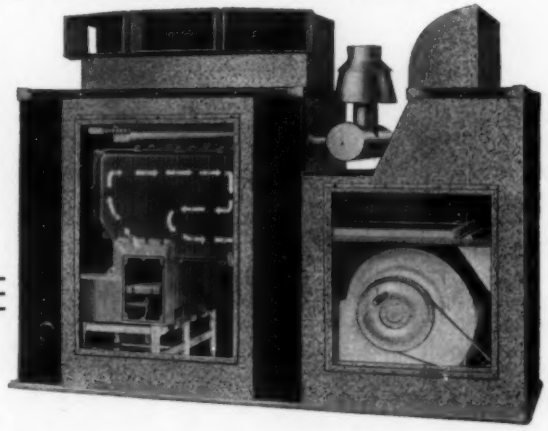

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In summer the Moncrief System produces a cooling effect by circulating clean air.

Efficient—Economical

The Moncrief System embodies all the latest improvements in design and construction. Specially designed heating sections have extra large radiating surfaces with relation to gas input. This, together with long horizontal gas travel (see arrows in allustration) produces extraordinary efficiency and economy.

Moderately priced, the Moncrief Gas Winter Air Conditioning System represents an unusual value. Made in nine regular sizes. Ask for folders and data sheets on Moncrief Gas Air Conditioning Systems.

The Henry Furnace & Foundry Co.

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A complete engineering service is available for advice on heating and air conditioning problems, for estimates and to make heating layouts.

Pipe Coating and Corrosion

(Continued from page 62)

tion produces a refinement in practice. He states as follows:

"For most air dried mineral soils the soil-water ratio of 1 to 2 is well adapted to the electrometric and colorimetric determinations of the pH concentration of soils. For peats or mucks the soil-water ratio may vary from about 1-3 to about 1-7."

"However for the determination of the pH value of soils, distilled water in equilibrium with atmospheric carbon dioxide and having a pH value of about 5.7 should be satisfactory, except in some instances, possibly, where the buffer capacity of a soil might be so low that the carbon dioxide content of air-equilibrated distilled water may be an interfering factor."

Acidity has been frequently mentioned and the usual conception is of the organic acids commonly used for experimental purposes in laboratories. Organic acids are found or developed under certain conditions existing in the media surrounding pipe lines but are not the most common acid found in soils. The organic acids may be used in demonstrating the effect of certain conditions on pipe metals but the numerical results found in laboratory tests are seldom directly applicable to practical conditions.

The humic acids of soil are not comparable in action to the inorganic types ordinarily used in laboratory tests. The humic acids common in nature and a frequent cause of corrosion are products of bacteriological action. An exact analysis of their composition is difficult if not practically impossible with present day methods.

(Soil surveying to be continued in December's issue).

Uniform Classification of Accounts

(Continued from page 40)

worth discussion. As to the second, it has been my considered opinion for a long time that any fairminded study of the Supreme Court decisions in which the phrase "original cost" is used will come to the conclusion first, that the Court was seldom, if ever, thinking of "original cost" precisely as defined in these new classifications, namely, as cost to the first owner to devote the property to the public service; and, second, that when the Court might possibly have had such a meaning for the term in mind, the function of "original cost" as a factor in determining fair value was merely that of checking the value at which a transfer of ownership had taken place under circumstances which might indicate that the transfer was not a genuine arms-length transaction. That the courts will ever find "original cost," as defined in these new classifications, to be primarily determinative of fair value for any purpose, is to me simply inconceivable.

However, we accountants in our insistence on factual accuracy as the basis for all accounting, have ourselves, I feel, a tendency to exaggerate the importance of the precise number of dollars in terms of which transactions are recorded. After all, dollars are important solely as a measure of value, just as feet, acres, or tons are important as measures of other magnitudes. In these days when no one knows what the standard of value will be a few years hence, it seems to me essential that accountants should keep their heads clear and recognize that when their records of past transactions are stated in terms of dollars which do not have the same value content as those of the date at which any particular financial statement is made, the statement is, to that extent a distortion of values. It is all very well to say that the accountant is dealing with costs and not with values, but the truth is that costs are significant only as they reflect values, and the accountant must be constantly on his guard against feeling that his whole duty is done if the number of dollars involved in any transaction is correctly recorded. This is regarded as heresy in some quarters, I know, and I do not wish to have it appear that I favor writing up or down the books of account to correspond with every fluctuation in the standard of value. I do say, however, that a point can be reached where the historical record of costs in terms of the number of dollars involved will be so far out of line with the actual value of the dollars that historical costs will have no practical significance and might just as well be forgotten.

I can readily illustrate my point by the experience of Germany during the post-war inflation. Does anyone suppose for a moment that it might now be of any significance whatever that the property of a German utility company was purchased or constructed at the height of the inflation for a fantastic number of marks? I do not anticipate that we in the United States are going to suffer Germany's catastrophic experience, although such an eventuality is uncomfortably possible. But I think it quite likely that within the next few years an inflation which will cut the present value of the dollar at least in half will occur and that purchasing power may, by a wiser control of currency, credit, and exchange machinery than heretofore, then be stabilized on that level for a long period. If that should be the outcome, it is inevitable that all accounts will come to be stated in terms of the then prevailing standard of value and not in terms of historical costs.

Customer Relations Committee Report

IRVING K. PECK, Chairman Binghamton Gas Works
Binghamton, N. Y.

(Continued from Accounting Section Report page 44)

The following summaries are of papers presented:

"Complaint Causes and Their Correction," P. W. Herring, The People's Gas Light & Coke Co., Chicago, Ill. This report and the appended exhibits submit to the industry the work of several gas companies that have given a great amount of thought to their complaint situation. The purpose of the study was to determine the underlying causes of complaints to the end that the number of justified complaints might be reduced. The report presents a detailed classification of these causes, quotes preventive measures that have been found effective, and recommends a plan of action to the industry.

"Ninety Ways to Improve Customer Relations," Louis Stoecker, Public Service Electric & Gas Co., Newark, N. J.

A review and digest for ready reference of reports sponsored and presented by the Customer Relations Committee of the Accounting Section, American Gas Association, together with a group of current practices by individual companies for improving customer relations.

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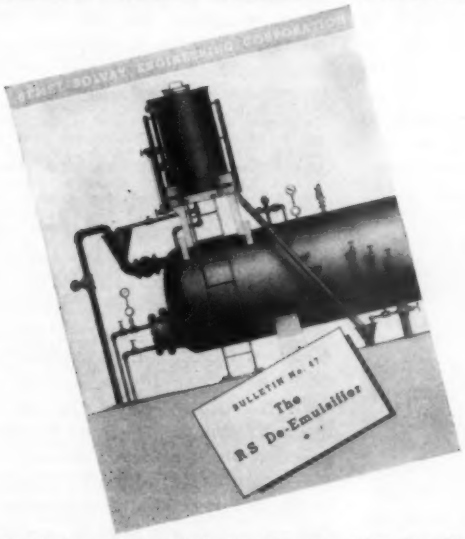

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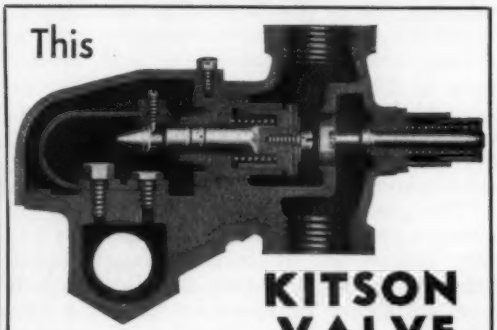

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Publicity and Advertising Stressed at AGA Convention

(Continued from page 14)

whole. "These estimates of 'known' or 'proved' natural gas, ranging from 30 to 75 trillion cubic feet, are from 16 to 40 times the 1⅞ trillion cubic feet produced and marketed in 1935, but one should not assume from this that natural gas operations in the United States will cease within the next 40 years. The frequency and magnitude of discoveries are as difficult to predict as trends in consumption."

Personnel Practices and Management received consideration at the last General Session.

Personnel Practices and Management

Mr. Erie A. Nichol, Chairman of the Committee on Personnel Practices reported that the training of executives, foremen or middle line supervisors and employees is being given increasing attention in the gas industry. "More than a third of the companies reporting have organized training work in some form and many of these have emphasized the value of foreman training programs as a means of developing satisfactory relations between management and employees.

"The problem of selection is receiving a prominent place in management discussion. It is recognized that in training particularly whether it be of laborer or executive, it is logical to give some attention to whether or not the right man is in the right job.

"Many companies have decided it greatly enhanced good will to have definite employee discharge procedure. This includes in some companies either or both dismissal compensation and impartial exit interviews.

"Proper standards of pay is felt by 46 companies to require the use of occupational standards developed through job analysis, the use of job specifications and planned salary classification. It seems clear that no organization performs its work well unless its workers are adequately paid. Several companies have made extensive studies to determine the proper distribution of monies available for wages and to see that the proper spread between groups of various levels is equitable, with proper consideration for individual differences of employees.

"Medical service is provided in some form by all companies reporting. Entrance physical examination is recognized as a prime requisite of selection of employees. Because of the adoption of new legislation affecting workmen's compensation, and because of the constant problem of sickness absence many companies have established dispensaries, hospital associations or have employed visiting nurses. Fourteen companies have dental service and eleven have optical clinics.

"Pension plans and group insurance covering health and accident and death benefits are generally recognized as being profitable to a company. Some companies provide similar benefits as a direct operating expense. Opinion has been expressed that the fully satisfied employee is the one, who given adequate pay and working conditions, is secure in the belief that his or her company, if its business prospers, will make provision for sickness and disability, vacations and old age.

"The growth of credit unions throughout the country is reflected in their use in the gas industry. A few companies have continued building and loan associations. Half of the companies have organized savings plans and about the same number provide loans to employees either through direct financial help, credit unions or by arrangement with local banks.

"Suggestion systems are carried on by one-third of companies reporting. More than half the companies have employee magazines. Nearly all of them sponsor or promote athletic activities in varying degree and approximately the same number have handbooks as a means of giving employees information about company benefits."

Also speaking on the subject of personnel management, Mr. Glenn Gardiner, Assistant to the President of the Forstmann Woolen Company, stated that it is highly desirable to adopt a definite policy of wage administration. It is important to *avoid* complaints from employees rather than to wait for them to develop. Also the channels of promotion should be kept open for *every* employee. The relations of executive with employee are no better than the employee's immediate boss makes them. Having a personnel department does not relieve the employer of responsibility to employee. We should try to appreciate the workers' point of view and recognize his intelligence. Retain an open and flexible attitude of mind with relation to employee problems. We must recognize the human factor in industry and finally—keep cool heads and maintain our perspective in employment relationships.

The Future of Housing Conditions

Mr. A. C. Shire, Editor of The Architectural Forum, stated that building for the last 10 years has not kept pace with normal population increase. Housing represents 40% of total building and indications are that there will be seven million building units erected during the next ten years. The boom is assuredly on the way. Surveys show a demand for modern kitchens, plenty of hot water and adequate heating.

Other important papers and reports presented at the General Sessions were as follows: "Progress in Testing Appliances," R. B. Harper, Chicago; "A Glance at the Rate Situation," A. I. Phillips, Chairman, Rate Structure Committee; "Selling Gas—Queen Mary Style," Davis M. DeBard, New York; "The Approval Seal As An Aid to Business," B. J. Mullaney, Chicago.

Radio Communication to Mobile Units for Normal and Emergency Dispatching in the Operation of Public Utilities

(Continued from page 29)

for nearly every conceivable purpose. What is to result from the hearing is yet unknown, for it will be months and possibly a year before the F. C. C. can arrive at any decisions. Whatever the outcome of this hearing may be, it is hoped that the public utilities will be allotted a portion of the wave bands with which to improve their services to the public. If frequency allocations are to be ultimately secured for the industry, it is necessary that all individuals interested keep the issue alive through repeated requests to the F. C. C. It is further important that the individual claims be condensed to a few common reasons. All utility companies have essentially the same claims for recognition and if these are often repeated the commission requirement of "necessity" will be established.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912, of American Gas Journal, published monthly at East Stroudsburg, Pa., for October, 1935.

State of New York } ss.
County of New York }

Before me, a Notary Public in and for the State and county aforesaid, personally appeared S. G. Krake, who, having been duly sworn according to law, deposes and says that he is the Business Manager of the American Gas Journal and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation) etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, American Gas Journal, Inc., 53 Park Place, New York City; Editor, Alfred I. Phillips; Managing Editor, S. G. Krake; Business Manager, S. G. Krake, 53 Park Place, New York City.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.) S. G. Krake, 53 Park Place, New York City.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company, but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the six months preceding the date shown above is ———. (This information is required from daily publications only.)

S. G. KRAKE,
Business Manager

Sworn to and subscribed before me this 30th day of September, 1936.

(Seal) MARY E. KELLEHER.
(My commission expires March 30, 1938.)

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ISBELL-PORTER COMPANY

Engineers and Contractors for Complete Gas Works

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Manufacturers of All Kinds of Gas Apparatus

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Monroe Beal and A.G.A. Awards

(Continued from page 13)

burned to a height of from two to three feet.

Mr. Creely, who at the time was in his office not far from the Standard Oil Company tank, was advised by Mrs. Warren Moore, 93 Hamilton Street, Somerville, N. J., that the tank was on fire. Upon investigation Mr. Creely saw an arc of flame creeping along the top edge of the tank, and realizing the hazard, and with complete disregard for his personal safety, immediately ran to the tank and climbed the forty-foot iron ladder to the top. Footing was treacherous as the top of the tank is slightly conical, it was wet, and there is no guard rail around the tank. Upon reaching the top of the tank he took off his rain coat and with it started at one end of the burning fumes to subdue the flames. Within a period of five minutes Mr. Creely had extinguished the last flicker of the flames.

George Armstrong, a Public Service Electric and Gas Company employee, followed Mr. Creely to the top of the tank and stood by ready to render assistance if required.

The award consists of a gold medal, button and certificate.

Dramatizing Gas

(Continued from page 70)

is hoped that these men's opportunities can be capitalized and thus the sale of modern gas appliances be materially increased.

This opportunity is by no means neglected by the Public Service Company of Colorado, as they have a very thorough and complete bonus system in operation whereby each and every employee is equitably repaid for his efforts in promoting sales, and their gas fitters and service men benefit materially in a financial way for their alertness. They see the need and prepare the way for the salesman to call and close the deal.

Though in operation only about two months, The Gas Hospitality House is attracting considerable attention. Not only are the daily meetings well attended, but the Company is having numerous letters of inquiry, and just recently the manager of the Utility Division of one of the country's largest electrical manufacturing companies spent several hours in person going over the activity in detail.

Much credit is due the personnel for their painstaking, tedious and thorough planning.

Last, but not least, the Public Service Company is a combination company who are to be congratulated, if not envied, in having their combined sales activities directed by a man like Gaylord B. Buck, who not only is the father of the thought and the sponsor of "GAS HOSPITALITY HOUSE" for the gas division, but was also the recipient of the McGraw-Hill award recently for two outstanding contributions to the electric industry. One the creation of a workable and successful dealer policy without subsidy, and the other for the inauguation of effective, co-operative promotion of electric service.

Such hearty co-operation and promotional activity, combined with the already well trained sales force, will undoubtedly materially increase the already enviable record which the Public Service Company of Colorado has attained for gas appliance sales and load building.

House Heating Progress During 1936

(Continued from page 42)

to see that it functions in a satisfactory manner. This does much to insure a satisfied customer. Following this, one inspection of each heating customer's equipment is made once during the heating season, without charge, at which time minor adjustments are made. All other service is charged for except calls made necessary by failure of equipment during the guarantee period. We have built our heating business on the basis that the customer must pay for servicing and cleaning his equipment and we are now glad we have refrained from employing a policy of unlimited free service, which we feel leads to abuses, resulting in excessive servicing costs.

The Future

Due to St. Louis County having been one of the bright spots in the entire country in residential building for the past year and a half, we have had the opportunity of viewing the effects on gas heating of the building boom that is now imminent in much of the territory throughout the country served with gas. Without any doubt, you are going to experience a marked increase in your heating loads if you are prepared to sell the potential business that will be represented by these new homes. There was never a time when people in all parts of the country were as "automatic heat" conscious as they are today. They are now ready to spend more money for winter air conditioning in their homes, as they have been sold on the proposition that it is worth more. And as we advertise "Gas Gives You So Much More for Your Money," they naturally want gas heat. It is strictly up to the Gas Companies themselves whether they take on this business or let their competitors have it.

In our case, approximately two-thirds of our contracts in 1935 and 1936 covered brand new houses and practically all of them were equipped with gas designed equipment. And what should be of particular significance to the equipment manufacturers is that last year over 80% of these gas installations in new homes were of the warm air type and this year over 95% were of this type.

In 1935 we signed up heating contracts witih 658 new customers. Of these approximately 400 covered new houses. In nine months of this year we have signed up 699 new heating customers, of which approximately 440 were in new houses. For the full year of 1936 we expect to secure not less than 900 new heating contracts or increase our saturation by more than 2%. This will be twice the number secured in 1934 and the increase is largely accounted for by the increase in the number of new buildings erected in our territory.

In quoting these figures I don't want to give you the impression that I am bragging. In fact, we have been fortunate in being in a territory that is building up rapidly and in having the opportunity presented to us of taking on a large volume of heating business in newly-constructed homes. At least we can take credit for taking advantage of the opportunity when it presented itself, by first, having a gas rate that made it possible for us to successfully compete for this business with other fuels; second, by having public acceptance of gas heating established in our territory through an advertising and sales program consistently and continuously carried on over a period of years; third, by having established a satisfactory dealer relationship through years of cooperation; and last, but not least, by having in the field an experienced, well paid, and competent force of salesmen to present our story to the public.

When your building boom strikes, be prepared.

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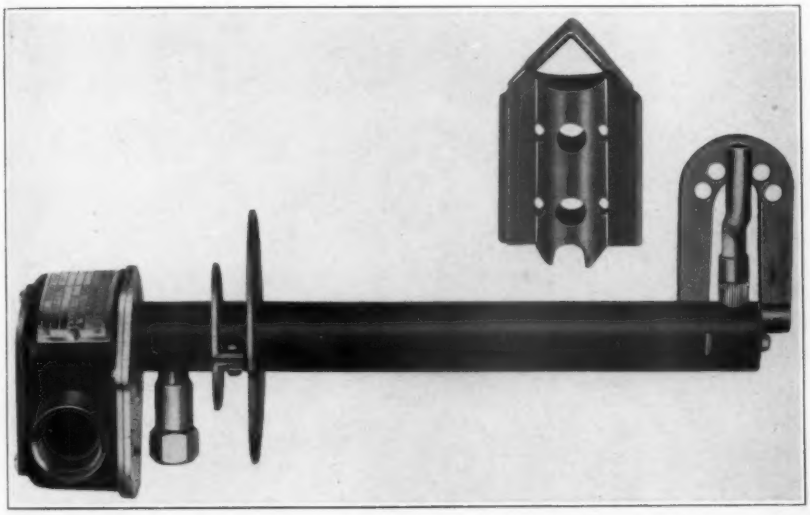

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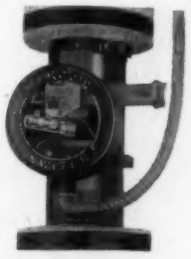

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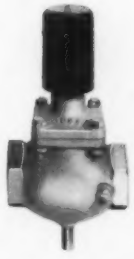

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